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An Integrated Risk Assessment Tool to Evaluate the Existing Risk Managment System Within a Health Care Facility

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DECLARATION

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ABBREVIATIONS

A&E	Accident and Emergency
ACIP	Advisory Committee on Immunization Practices
ACoP	Approved Code of Practice
ADAMS	Aircraft Dispatch and Maintenance Survey
AIDS	Acquired Immune Deficiency Virus
AIMS	Australian Incident Monitoring Study
AIRMIC	Association of Insurance and Risk Managers
ANOVA	Analysis of Variance
AP	Aerosolised Pentamidine
APRG	Aerospace Psychology Research Group
BBV	Blood Borne Viruses
BMA	British Medical Association
BRE	Building Research Establishment
BS	British Standard
BS 8800	Guide to Occupational Health & Safety Management Systems
BSE	Bovine Spongiform Encephalopathy
CAP	Controls Assurance Project
CBI	Confederation of British Industry
CDAD	*Clostridium difficile* Associated Diarrhoea
CDC	Centres for Disease Control and Infection, US.
CDSC	Communicable Disease Surveillance Centre
CJD	Creutzfeld-jakob Disease (CJD)
CMC	Contaminated Material Containers
CMV	Cytomegalovirus
COSHH	Control of Substances Hazardous to Health, UK
DHSS	Department of Health and Social Security, UK
DNA	Deoxyribonucleic Acid
EC	European Commission
EHO	Environmental Health Officer
EMS	Environmental Management Systems
EU	European Union
FDA	Food and Drugs Administration
FMECA	Failure Modes and Effects Criticality Analysis
FPA	Fire Prevention Association
FPN	Fire Prevention Notes
HACCP	Hazard Analysis Critical Control Points
HAV	Hepatitis Virus A
HAZOP's	Hazard and Operability Studies
HBV	Hepatitis Virus B
HCV	Hepatitis Virus C
HCW's	Health Care Workers
HIV	Human Immunodeficiency Virus
HMV	Herpes Simplex Virus
HSA	Health and Safety Authority
HSAC	Health Services Advisory Committee
HSC	Health and Safety Commission
HSE	Health and Safety Executive
HTM	Health Technical Memoranda
ICN	Infection Control Nurse

ICNA	Infection Control Nurses Association
INO	Irish Nurses Organisation
IOSH	Institution of Occupational Safety and Health
IPBMI	Irish Public Bodies Mutual Insurance Ltd.
ISO	International Standards Organisation
ISO 14001	Environmental Management Standard
ISO 9000	Quality Management and Quality Assurance Standard
IV	Intra venous
MMWR	Morbidity and Mortality Weekly Report
MORT	Management Oversight and Risk-free Tree
NCHD's	Non-consultant Hospital Doctors
NHS	National Health Service
NIOSH	National Institute for Occupational Safety and Health
NRL	Natural Rubber Latex
NSI	Needlestick injury
OHSAS	Occupational Health and Safety Management Systems
OSHA	Occupational Safety and Health Administration
PEP	Postexposure Prophylaxis
PHLS	Public Health Laboratory Service
PI	Percutaneous Injuries
PNR	Patient per Nurse Ratio
PPD	Purified Protein Derivatives
PPE	Personal Protective Equipment
PR	Disposable Particulate Respirator
QMV	Qualified Majority Voting
RCT	Randomised Control Tests
RNA	Ribonucleic Acid
RoSPA	Royal Society for the Prevention of Accidents
RSI	Repetitive Strain Injury
SCA	Structural Chromosomal Abnormalities
SCARF	Safety Courses for Airport Ramp Functions
SCE	Sister Chromatid Exchanges
SDC	Sharps Disposal Container
SEA	Single European Act
SEQ	Safety, Environment & Quality
SHE	Safety, Health & Environment
SHO	Senior House Officer
SMS	Safety Management Systems
SPSS	Statistical Package for the Social Sciences
SSM	Strategic Safety Management
TB	Tuberculosis
THERP	The Human Error Role Probability Technique
TQM	Total Quality Management
TUC	Trade Union Congress
UP	Universal Precautions
VDU	Visual Display Unit
VZV	Varicella Zoster Virus
ZDV	Zidovudine

GLOSSARY OF TERMS

Active failures	Failures which are dormant in the organisation
Aerosolised Pentamidine	Drug treatment given to patients with HIV infection to treat or to prevent *Pneumocystsis carinii* pneumonia
Antineoplastics	The term used to describe the multiple classes of drugs used in the treatment of persons with cancer
Cutaneous	Pertaining to the skin
Cytotoxic	Causing cell damage
Darkroom Disease	A variety of allergic type reactions reported by radiology workers
Dormant failures	Failures which have an immediate effect
Endoscopy	Medical procedure used to visualise internal organs
Hazard	The potential to cause harm (including ill health and injury), damage to property, plant, products or the environment, production losses or increased liabilities
Iatrogenic infections	Infections acquired from medical personnel or treatment
Nosocomial infections	Infections acquired from a health care facility
Pathogenic bacteria	Disease carrying bacteria
Pediculosis	Lice
Percutaneous	A technique performed through the skin, as an injection of material or the removal of tissue by a needle
Pertussis	Whooping cough
Phenomenological	Qualitative analysis
Phlebotomy	To puncture a vein for the purpose of withdrawing blood
Percutaneous Injuries	e.g. needle-stick injuries, cuts from sharp objects
Positivistic	Quantitative analysis
Postexposure Prophylaxis	Prevention of an illness arising after a known exposure, before the period of incubation has finished

Reproductive hazards	Hazards from waste anaesthetic gases, antineoplastic drugs, etheylene oxide etc. that affect the reproductive cycle
Risk	The likelihood that a specified undesired event will occur due to the realisation of a hazard by, or during work activities or by the products and services created by work activities
Rubella	German Measles
Rubeola	Red Measles
Seroconversion	The development of antibodies not previously present resulting from a primary infection, i.e. preventing the person from becoming HIV positive after exposure to the HIV virus
Sharps	Sharp objects, e.g. syringes, broken glass etc. that could give rise to a cutaneous or subcutaneous injury
Streptococcal pharyngitis	'Strep' throat
Subcutaneous	Under the skin
Third-party	Inpatients, outpatients and visitors
Tuberculosis	The term "tuberculosis" refers to a clinically apparent active disease caused by *Mycobacterium tuberculosis*
Universal Precautions	The use of appropriate personal protective equipment for anticipated contact with blood or body fluids
Varicella	Chickenpox, Shingles
Zidovudine	Antiretroviral therapy

ABSTRACT

Risk assessment is a method used to identify risks within an organisation. It is required by the Safety Health and Welfare at Work Act, 1989, for the purpose of safety management.

No one method can effectively identify all types of hazards and risks within organisations. The insufficiency of individual risk assessment techniques to generate objective data as to the level of risk, is now generally accepted as an issue in risk management. Therefore a combination of risk assessment techniques, best suited to the organisation, could improve risk assessments.

This study set out to develop and combine a number of risk assessment techniques in order to evaluate the broad spectra of hazards and risks within an organisation. Having developed this risk assessment tool, it was then applied to a health care facility.

Three risk assessment techniques were employed for the purpose of this study. These were: workplace survey, (inspection of the premises), analysis of 1,365 accident / incident report forms over an 18 month period and a dedicated psychometric risk assessment technique.

Each of the risk assessment techniques highlighted hazards and risks to the organisation. Together, however, they provided the health care facility with additional hazard evaluation data as well as a more detailed qualitative and quantitative description of the hazards and risks.

The data generated supported the concept that in order to implement an integrated risk management system, a combination of risk assessment techniques is required to elicit and evaluate the hazard profile along a broad spectra of hazards

This study has supported the use of this risk assessment tool in the health care facility. Furthermore, the underlying concept of conjoining risk assessment techniques can be extended to other sectors requiring a risk management system.

CHAPTER ONE
INTRODUCTION

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1. INTRODUCTION

There has been a shift of emphasis on the management of health and safety, from the purely technical aspects, many of which are covered by standards and official guidance; to the behavioural and managerial (Ridley & Channing, 1999). There is now less emphasis on prescriptive enforcement and more emphasis on the human element in risk management, which examines the cultural, organisational, group and individual which are frequently contributing causes of disasters (Royal Society, 1992).

Hence the emphasis has shifted from a traditional injury prevention approach to health and safety emphasising prediction and control of all forms of risk and loss. The traditional form of risk management is that it is a function within a business in the same way as marketing, purchasing and finance. Risk management should be considered a process rather than a function of the business whose primary task is to establish the nature of all risks which a business is likely to face (Garavan, 1997).

The future of health and safety is changing. There is increasing focus on the consequences of recent economic, social and political developments for the future of health and safety regulation. Walters, (1999), suggests that there is now greater concentration on the inspection of management systems, instead of checking for compliance with specific regulatory requirements. This aims to promote self-regulation and liberate inspection resources to be concentrated on recalcitrant serious offenders.

Risk assessment techniques have been criticised by Frosdick, (1997). Frosdick states that the techniques of risk assessment are necessary for ensuring the decision making processes of risk management are scientifically informed, but are insufficient in themselves. Dickson, (1991), states that it is unlikely that one risk assessment technique will solve all problems. Therefore a combination of risk assessment techniques will help to provide a detailed analysis of the risks.

1.1. AIM

The development, validation and implementation of a dedicated risk assessment tool to evaluate the risk management system in a health care facility.

1.2. OBJECTIVES

- To conjoin specific risk assessment techniques to formulate a dedicated risk assessment tool.
- To develop a dedicated psychometric risk assessment technique.
- To evaluate the risks presented by the health care facility.
- To apply the risk assessment tool to generate the necessary data as part of the implementation process for an integrated risk management system.

1.3. RISK ASSESSMENT

The term 'risk' must first be defined. Risk has been defined as:

"the likelihood that a specified undesired event will occur due to the realisation of a hazard by, or during work activities or by the products and services created by work activities" (HSE, 1997c).

A risk has been described as having two elements – the likelihood that a hazard may occur and the consequences of the hazardous event (BS 8800, 1996).

'Risk assessment' has been further defined as:

"the process of estimating and evaluating a risk in order to determine whether current risk strategies are appropriate and adequate and involves three steps - identification of hazards, assessment of risk and implementation of control measures"

(Waring & Glendon, 1998).

Risk assessment, a method used to identify risks within an organisation, is required by the Safety, Health and Welfare at Work Act, 1989, for the purpose of safety management. It is a central component of risk management forming the basis for control measures. There are six steps involved in the assessment of risk. These are as follows:

1. Health and Safety Policy

This is a declaration of management's commitment to ensuring a workplace that is safe and healthy as far as is reasonable practicable and that all relevant statutory instruments are complied with. It will provide a framework for the management of health and safety.

2. Identification of Hazards

Hazards or threats may be physical entities, conditions, substances, activities or behaviours which are capable of causing harm (Waring & Glendon, 1998). Each employer is required to examine the place of work systematically and identify existing hazards.

3. Assessment of Risk

Risk represents more than the mere existence of a hazard – it should take account of the likely scale of consequences, the frequency, duration and the extent of hazard exposure, the probability that an unwanted / desired event will occur and the time scale over which consequences might be manifested and probabilities assigned (Waring & Glendon, 1998).

If there is a hazard present, the next step determines the likelihood of it happening and the consequences of it happening (Garavan, 1997) (Figure 1.1). Risk should be thought of in terms of 'chance taking'. What is the probability of an accident occurring? Risk reflects both the likelihood that harm will occur and its severity (Ridley & Channing, 1999).

Once a risk profile has been compiled, the impact of each risk in the organisation requires an assessment to place risks in an order of priority in terms of the control action required, i.e. short, medium or long term risks. Numbers can also be assigned to risk where 100 points may require immediate action and 0-9 points may require action to be taken within the following three months (Ridley & Channing, 1999).

4. Precautions required

Once a hazard has been identified and the risk has been assessed, necessary arrangements are made to implement control measures and safeguards. The nature of control relies on specific legislative requirements, the probability and availability of resources involved. Control measures are designed to reduce the risk to a tolerable level, i.e. the risk is reduced to the lowest level that is resonably proacticable (BS 8800, 1996). The four levels in the 'control hierarchy' often applied are:

- Eliminate, substitute or reduce
- Control at source

- Safe systems of work
- PPE (Personal Protective Equipment), only to be used as a last resort.

The control hierarchy the basis upon which the 'Nine General Principles of Prevention' in the Health, Safety and Welfare at Work (General Applications) Regulations, 1993 (First Schedule) are made. These nine principles have been taken directly from the 1989 Framework Directive on Safety and Health at Work. Since they are the basis for the approach in many EC directives on safety and health at work, they provide a useful checklist by which an organisation can judge its approach (Byrne, 1997).

5. Record findings

All hazards should be recorded and conclusions should also be drawn from each of these hazards. Results of the risk assessment should be communicated to all employees.

6. Review the programme and update when necessary

Following risk assessments and improvements, changes will be required in order to revise the safety statement. Such changes may include changes in work processes, organisational structure, equipment or substance used, technical knowledge, legislation or standards (HSA, 1999b)

1.4. RISK MANAGEMENT

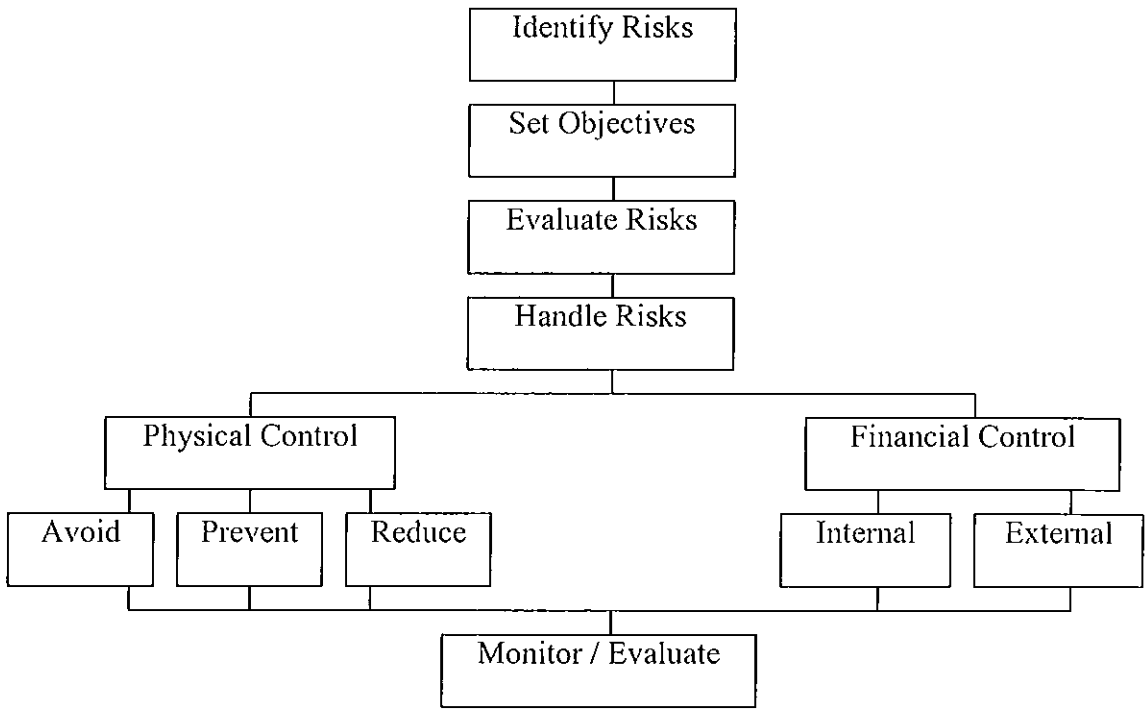
'Risk Management' is not solely restricted to insurance terms, i.e. securing the best liability cover for the lowest premiums, but is broadly defined as:

"A field of activity seeking to eliminate, reduce and generally control pure risks (e.g. safety, fire, major hazards, security lapses, environmental hazards) and to enhance the benefits and avoid detriment from speculative risks (e.g. financial investment, ... commercial and business risks)" (Waring & Glendon,1998).

Risk management is the term normally applied to the whole process of risk identification, evaluation, reduction and control (Cox & Tait, 1998). It helps provide bottom line positions by cost reduction (loss prevention, reducing insurance costs) and improving the likelihood of overall business success. Spectacular risk management failures such as the Piper Alpha disaster attract the attention of the media but many

organisations suffer large cumulative losses from a multitude of lesser incidents (Waring & Glendon, 1998).

Figure 1.1
The Risk Management Process (Adapted from Garavan, 1997)



1.4.1. Cost Effectiveness of Risk Management

In order to be able to demonstrate cost-effectiveness (or cost benefit), there is a need to be able to quantify the cost of all losses associated with accidents, which will impact on the overall profitability of the organisation. Although the total costs of accidents within a company may be relatively small, it can amount to approximately 2% of the annual running costs and represents a direct drain on profits (Ridley & Channing, 1999). In a study carried out by the HSE, in a National Health Service (NHS) Hospital in 1991, 5% of the annual running costs were attributed to 1,232 recorded accidents between March and June, 1991 (HSE, 1997d). Any reduction of these costs that may be made through a cost-effective risk management programme will lead both to a safer and more profitable organisation (Ridley & Channing, 1999).

1.5. RISK ASSESSMENT TECHNIQUES

Because risk is a multi-dimensional concept (safety, insurance, financial), different approaches to risk assessment are required to cover the varieties of their risk and contexts (Waring & Glendon, 1998). It is better to integrate assessments for all hazards and not carry out separate assessments for health hazards, manual handling, machinery hazards. If assessments are carried out separately, using different methods, ranking risk

control priorities is more difficult. Separate assessments may also lead to needless duplication (BS 8800, 1996).

Risk assessment will reveal a number of risks, but risks do not respect time. In a few weeks or months, new risks will emerge, therefore risk assessment must be an on-going process and may have to be adapted to monitor new risks (Dickson, 1991).

The techniques of risk assessment are facilitative tools, intended to maximise the opportunity of identifying all the risks or hazards inherent in a particular facility, system or product. The tools may be categorised under the broad headings of intuitive, inductive and deductive techniques (Frosdick, 1997; Cox & Tait, 1998).

- One **intuitive** technique is 'brainstorming'. It is quick and simple but lacks the comprehensive approach of a more sophisticated technique over other intuitive techniques. Ideas are consolidated, then further developed by committee meetings.
- **Inductive** techniques include preliminary hazard analysis, checklists and human error analysis, e.g. HAZOPs. Industry methods focus on what could go wrong, or what might be expected to happen, in particular circumstances, given previous experience.
- **Deductive** techniques begin with what has occurred and use knowledge and experience to work back to 'deduce' the cause. They involve accident investigation and analysis (Frosdick 1997; Cox & Tait, 1998).

Some of these techniques overlap where a combination of techniques may be used. Several techniques employed to identify risks within an organisation are as follows:

- Management / Worker Discussions
- Independent Audits
- Job Safety Analysis
- Accident Statistics
- Workplace Inspections
- Hazard and Operability Studies (HAZOPs)
- Failure Modes and Effects Criticality Analysis (FMECA)
- Fault Tree Analysis
- Event Tree Analysis
- Checklists
- Organisational Charts and Flow Charts
- Questionnaire studies
- Hazard Indices
- The Human Error Role Probability Technique (THERP)
- Management Oversight and Risk-free Tree (MORT)

(Ridley & Channing, 1999; Frosdick 1997; Garavan 1997).

Workplace Inspection

This is probably the best known and the most often used risk assessment technique. This method allows the risk specialist to survey the premises and facilitates contact with employees who may have important information concerning risks and hazards in the workplace. Workforce involvement in risk assessments is therefore advisable because workers are often aware or pertinent facts which managers may not know. It is time consuming, therefore preparatory work such as creating checklists, reading previous reports and detailing the responsible personnel for different operations in the facility must be carried out before the inspection can take place (Dickson, 1991; Garavan, 1997).

HAZOPs (Hazard and Operability Studies)

A HAZOP study is a formal systematic examination of a processing plant in order to identify hazards, failures and operability problems and assess the consequences from such mal-operation. HAZOP is the most widely used method of analysis of hazards in the process industry sector. The basic philosophy behind the HAZOP technique is that if a process operates within intended design philosophy, the undesired hazardous events should not occur. It involves a structured 'brainstorming' exercise in which a multidisciplinary team of experts systematically consider each item of the plant. Deviations can be investigated to eliminate their causes as far as possible and minimise the impact of their consequences. HAZOP is flexible and can be used to identify potential hazards in buildings and facilities of all kinds at all stages of their design and development (Frosdick, 1997; Wells, 1997).

Failure Modes and Effects Criticality Analysis (FMECA)

The FMECA studies are carried out by an individual expert with a thorough understanding of the particular system under investigation. They are a step by step procedure for identifying failure modes or design weaknesses and criticality of the consequences of failure. The systems under investigation are converted into graphical form by the preparation of a block diagram depicting its functional component and subsystems (Frosdick, 1997).

Fault Tree Analysis

Fault trees are widely used as communication aids to demonstrate system failures and their development to managers, designers and operators. They depict the way in which

a particular system error might occur. The failure mode forms the top of the event tree. Working downwards through branches, using "and/or" logic gates, the analysis reveals the combination of events which themselves causes the top event to occur. Such analysis forms an understanding of how the failure could occur and what design modifications may be required (Frosdick, 1997; Wells, 1997).

Event Tree Analysis

This shows the consequences of a particular failure asking sequential questions to which the answer is either yes or no. Following the alternative answers through the tree will lead to a variety of consequences ranging from minor damage with no injuries, to severe damage and possible fatalities (Frosdick, 1997).

There is some subjectivity involved in fault tree analysis and event tree analysis risk assessment techniques. The question of the results depends on the ability of the analysis team. This technique can be criticised as it does not offer adequate allowance for human failure such as operator error (Royal Society, 1992).

Checklists

These aim to provide stimulus to critical appraisal of all aspects of the system rather than to lay down specific requirements. Many checklist questions are of a general nature and the assessor must interpret them as seems most appropriate to the particular system being expressed. Once they are prepared they can be distributed to various departments and completed by those personnel, or alternatively, can be used by the risk manager when conducting a physical inspection. Checklists must therefore be unambiguous so that the person completing it will be in no doubt as to what to complete. Personnel (other than the risk manager) completing the form may not be as honest as the risk manager and may not wish to portray a negative picture of their department (Dickson, 1991; Royal Society, 1992).

Organisational charts and flow charts

Organisational charts can be used to illustrate different aspects of the organisations activities and structure and will 'pinpoint' areas of risk within the organisation. Flow charts are not restricted to the organisational structure of the company, but divide the

problem into manageable portions. The flow chart is not intended to identify the causes of loss but highlight the effect of certain events (Dickson, 1991).

Questionnaire studies

These can be used to acquire information about risk. A questionnaire is cost effective and a simple way of obtaining risk information and allows for comparisons. In addition, questionnaires can usually be adjusted to take into account changes that have occurred. Because the questionnaire is completed by somebody other than the person who designed it, the responses may be deliberately or accidentally inaccurate (Garavan, 1997).

Hazard Indices

This approach is a quantitative method of identifying risk and hazard indices. There are a number of sources which can be used to provide hazard indices, one of which is the Dow Fire and Explosion Index. The objectives of hazard indices are to express the degree of risk by measuring the likelihood of loss, express the result as a number to which others can be compared and to provide an understanding of the maximum amount at risk in any process as well as the estimated area of exposure (Garavan, 1997).

The Human Error Role Probability Technique (THERP)

THERP is a technique which can be used to predict the potential for human error in a work activity. It evaluates in quantitative terms, the contribution of the human error component, in the development of the incident. It adopts the concept of basic error rate which it assumes to be relatively consistent between tasks requiring similar human performance efforts. The methodology employed in THERP consists of four elements: selecting the system failure; identifying all the behavioural elements; estimating the probability of human error; and calculating the probabilities as to which human error will produce the accident or incident or system failure (Garavan, 1997).

Management Oversight and Risk-free Tree (MORT)

MORT, a systematic approach to the management of risk in an organisation, is an analytical technique which places significant emphasis on management oversight as a contributory factor to accidents at work. It can help to determine the order of risks and allow them to be dealt with appropriately. It also facilitates the best allocation of

resources to prevent and reduce the number and severity of adverse incidents and accidents. It is based on four philosophical principles:

- Management takes risks including cost, production, quality of environment and health and safety risks.
- Risks in one area affect operation in other areas.
- Risks should be made explicit where possible and the organisation should know the potential consequences of these risks.
- Risk management techniques should be adaptable to suit a wide range of situations (Garavan, 1997).

Many of these risk assessment techniques are insufficient in themselves as they rely on hindsight, from which lessons are often not learned, and which cannot in any case predict the future risks we face (Frosdick, 1997).

1.6. SUBJECTIVE RISK ASSESSMENT

Objective risk relates to the variety of ways in which the mathematical probability of the occurrence of an accident or incident can be expressed. Subjective risk relates to the psychosocial dimension associated with perceived danger (Weyman & Kelly, 1999).

Risk ranking and risk assessment will be evaluated and carried out differently by engineers, natural scientists, occupational safety professionals, psychologists, sociologists, economists, lawyers and decision makers according to their own needs and world views. This not to say that one approach is necessarily better or worse than another, for all have their merits and demerits (Ball, 1997).

Scientists and engineers are often concerned with putting numbers on risk through the calculation of probabilities and the use of data bank information on failures and reliability. A common engineering approach in the process industries, is the use of HAZOP. The engineering paradigm fails to assess the influences of cultural bias on risk perception. Different expressions of quantified risk, impact on the way in which the risk is subsequently perceived. It is necessary for engineers to quantify what is an acceptable risk in particular circumstances to have a target for their risk assessment exercise. In this respect. It can be argued that all assessments of risk involve a degree of subjectivity to a greater or lesser extent (Frosdick, 1997; Pidgeon & Hood, 1992). Social scientists on the other hand believe there are serious difficulties in attempting to view risk as a one-dimensional concept when a particular risk or hazard means different

things to different people in different contexts, i.e. risks are subjective and socially constructed (Royal Society, 1992).

Each organisation should select the techniques appropriate to their needs, assess how these fit into the general scheme of things and how it relates to the activity of risk management (Ball, 1997). The following are examples of different risk assessment techniques.

The ***natural science*** approach to risk assessment, ranks the risk in the order of likelihood (Ball, 1997).

Major hazard control expresses risk as the product of frequency and consequence (expectation value). Expectation values are often used in industries which deal with high consequence low probability hazards, such as the nuclear industry, chemicals, railways etc. (Ball, 1997).

The ***occupational safety*** approach is similar to the expectation value, in that hazards are scored on a simple scale according to the product of their probability of occurrence (e.g. measured on a scale of 1 (improbable) to 6 (common)) with severity of consequence (e.g. measured on a scale of 1 (trivial) to 6 (multiple fatalities)) (Ball, 1997).

Economics ranks risks by attempting to rank solutions e.g. the main aim of a fixed budget for health and safety would be to optimise the benefits by calculating the cost of each of the safety measures available and balancing this against the associated life saving or injury avoidance. This would permit cost-effectiveness ratios to be calculated for each measure, so producing an alternative ranking of risks with the focus this time being on benefits or goals (Ball, 1997).

The ***psychology*** perspective incorporates risk perceptions of the public where the psychologists believe that the risks calculated by the scientists do not match those of public perception. Public perception includes a broader set of values when comparing risks and this results in different priorities from those arrived at by more reductionist thinking of scientists. Psychologists see risk as an individual construct derived from

perceptions informed by factors such as familiarity, dread and the greater fear in which societal risks are held (Ball, 1997; Frosdick, 1997).

Sociologists propose that risk is a socially constructed phenomenon. One theory, known as the cultural theory, propose that individuals fall into one of four groups, known as, hierarchists, egalitarians, individualists or fatalists, each of which has its own legitimate view of the world. Depending on which group one belongs to, one's risk ranking priorities would be dictated by the particular beliefs of the group (Ball, 1997). Dake, (1991), found that cultural biases of hierarchy, individualism and egalitarianism are predictive of distinctive rankings of possible dangers and preferences for risk taking at societal level.

1.6.1. Risk Perception

Assessments of risk, whether they are based upon individual attitudes, the wider beliefs within a culture, or on the modes of mathematical risk assessment, necessarily depend upon human judgement (Royal Society, 1992).

Risk assessment depends on the quality of the team doing the analysis and the credibility of the results may be conditioned by the confidence one has in the professional ability (Royal Society, 1992). Perhaps the tools with which risk managers have to work are themselves defective; there is certainly ample evidence of misuse and calamity. In this situation the best remedy is for risk assessors and decision makers to be clear and fully informed as possible on the purpose of an activity, on the nature of the tools at their disposal, and to be aware of their strengths and limitation (Ball, 1997).

1.7. SAFETY CLIMATE, CULTURE AND ATTITUDES

The concepts of safety climate and culture represent the work environment and underlying perceptions, attitudes and habitual practices of the workforce at all its various levels (Kennedy & Kirwan, 1998).

1.7.1. Safety Climate

Safety Climate reflects the symbolic (e.g. posters in the workplace, condition of the premises etc.) and political (e.g. managers voicing their commitment to safety, allocation of budgets to safety etc.) aspects of the organisation which constitute the

work environment. These factors in turn will characterise and influence the deployment and effectiveness of the safety management resources, policies, practices and procedures. The safety climate may or may not be a tangible manifestation of the underlying beliefs and values embodied in the organisational safety culture, though it should be related to it (Kennedy & Kirwan, 1998). It may be viewed as a temporal state measure of culture, which is reflected in the shared perceptions of the organisation at a discrete point in time (Cheyne, Cox, Oliver, et al, 1998).

Efforts to improve management commitment and worker involvement appear to be particularly important in creating a more positive safety climate. One way to increase management commitment is to include safety performance in the performance-appraisal process for management personnel. Such action will help integrate safety into the total management system of the organisation (DeJoy, 1994).

1.7.2. Safety Culture

The notion of culture was developed in the 19th century in an attempt to understand the diversity of human societies. Anthropologists at the time were interested in the customs, myths and folkways of isolated pre-industrial peoples (Back & Woolfson, 1999). Safety culture then developed as a concept and came to prominence after the Chernobyl nuclear accident in 1986 where human errors and violations of procedures were referred to as evidence of a poor safety culture (Kennedy & Kirwan, 1998). The Confederation of British Industry (CBI) in its 1990 report entitled 'Developing Safety Culture – Business for Safety', described safety culture as "the way we do things around here" (Back & Woolfson, 1999).

The safety culture of an organisation is the product of individual and group values, attitudes, competencies and patterns of behaviour that determine the commitment to and the style and proficiency of an organisations health and safety programmes. Organisations with a positive safety culture are characterised by communications founded on mutual trust, by shared perceptions of the importance of safety and by confidence in the efficiency of preventive measures (Booth & Lee, 1995).

Organisational culture, is increasingly identified as a key factor in the success or failure of enterprises. There may be different identifiable cultures within an organisation's

management. Safety culture is measured typically by surveying workforce attitudes and key elements are then extracted to establish which attitudes are important – i.e. which predict changes or differences in accident rates (Waring & Glendon, 1998). Safety culture will have an influence on safety climate and it could be argued that a good safety culture will be promoted and maintained by a 'good' safety climate (Mearns & Flin, 1997). Although the concept of safety culture has generally been applied at the organisational level, logically, it could equally be applied to subdivisions of an organisation, such as individual departments, workgroups or individuals of similar employment status (Weyman & Kelly, 1999).

It is important that safety culture is not separate and distinct from the culture of the organisation concerned – it is part of the organisations culture. Substantive cultural change in an organisation is likely to take 5 to 10 years (Waring, 1996).

Developing and promoting a safety culture is an important aspect of health and safety management. It must be coupled with recognition of achievement, commitment from the very top of the organisation and a clearly defined system for assessing achievement which is both measurable and achievable by those concerned (Stranks, 1994). The best safety cultures stem from organisations that adopt an attitude of "constructive intolerance" of unsafe and potentially unsafe conditions. This can help ensure a continual improvement in health and safety performance (HSE, 1999).

1.7.3. Safety Attitudes

It is now widely accepted that in seeking to understand, predict and control human behaviours in organisations, it is necessary to address both individual and group characteristics due to the mutual influence between groups and individual behaviours (Waring, 1996).

Social, cultural and political processes are acknowledged as being involved in the formation of individual attitudes towards risks and their perceptions (Royal Society, 1992).

It is a strange quirk of an organisation, that the attitude held in the boardroom, although there is no direct communication, inevitably manifests itself in the attitudes and

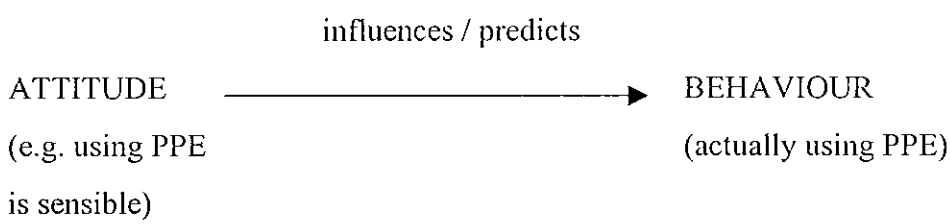
behaviours of the shop floor or general office. This attitude or culture, which permeates the organisation, emanates from the highest level. If the attitudes at the top of the organisation are concerned with achieving high standards of health and safety, that attitude will permeate the organisation and be measurable in the workplace with high levels of safety performance (Ridley & Channing, 1999).

An attitude can be defined as a learned tendency to act in a consistent way to a particular object or situation. Workplace attitudes are relevant to safety and risk professionals because they are a component of safe behaviour. Attitude can influence or predict behaviour and vice versa. E.g. if we know someone's attitude to using PPE, we can then predict their behaviour. If this person's attitude were to change, then this will influence the relevant behaviour (Figure 1.2).

Figure 1.2

Attitude – Behaviour link

(Adapted from Glendon & Mc Kenna, 1995)

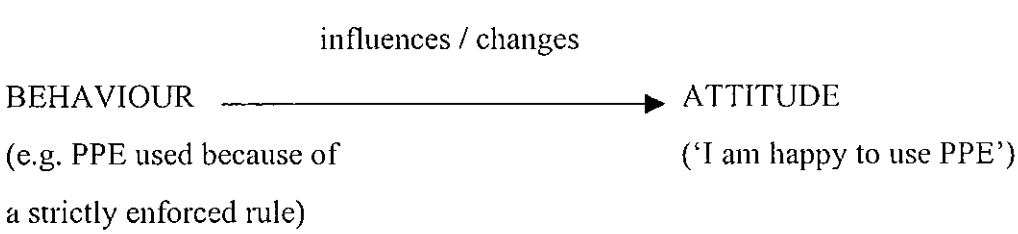


If ways can be found to change people's behaviour, then their attitudes will change to correspond to that behaviour e.g. if people repeatedly take various safety precautions at work, they might conclude that they possess positive safety attitudes (Figure 1.3).

Figure 1.3

Alternative theory to attitude – behaviour link

(Adapted from Glendon& Mc Kenna, 1995)



The measure of employee attitude towards safety and their perceptions of workplace hazards at a discrete point in time, can thus provide some indication of the nature of an organisations safety climate (and underpinning safety culture). Employee attitudes are one of the most important indices of safety culture and climate since these attitudes are often framed as a result of all other contributory features of the working environment (Cheyne, Cox, Oliver, et al, 1998).

Attitudes can influence a person's behaviour. When seeking to effect behaviour, a wide range of issues such as previous behaviour, social norms and pressures, risk perception, motivation, individual differences and workplace factors should also be addressed (Glendon & Mc Kenna, 1995).

Organisational characteristics, such as the promotion of a positive culture and climate in health and safety issues, the development of policies which allow for human capabilities and fallibilities, the continuous demonstration by top management of its active involvement in safety issues are conducive to effective safety attitudes, behaviours and performance. The establishment, development and promotion of a safety culture is now considered a prerequisite to good health and safety management and to ensuring compliance with health and safety legislation. The benefits of such a culture should be considerable – including the reduction of accidents, sickness, absence, lost time and insurance premiums, an increase in the overall safety performance, morale and commitment (Garavan, 1997).

1.8. PSYCHOMETRIC ANALYSIS

Psychometric analysis is employed to study individual risk perceptions. Respondents are required to give their judgements (this is expressed preferences) of risk for a range of hazards. Groups of respondents rate sets of activities or risk sources, typically sets of preselected hazards either in terms of their degree of similarity or dissimilarity to each other, or in terms of their perceived characteristics, such as the degree to which a source is personally controllable or not. This method maps aspects of the psychological meaning of the presented activities onto a set of rating scales. Multivariate statistical techniques analyse the patterns of correlations between the set of ratings. Analysis can then focus upon relations between the hazardous items or the rating scales, as well as significant differences between respondents that arise as a result of individual or group

differences (Pidgeon & Hood, 1992). The ability to predict the behaviour of groups or individuals faced with a hazardous situation is an important factor in risk assessment.

1.9. CONCLUSION

Most of the risk aspects of an organisation involve not not only physical hazards but the self-sealing behaviour associated with power relations and culture of the organisation. Current quantitative risk assessment techniques and engineering methods are not capable of a complete and therefore convincing assessment of the risks to safety arising from organisational culture, ideologies, power relations, motivations, attitudes or perceptions. Multiplying probabilities together, which assumes that each is independent of each other, holds true for many physical engineering solutions, but not for many human ones. When one considers the scale of consequences of disasters such as Piper Alpha and Kingscross, it is surely now essential that high powered risk assessment should address these group human factors in a more realistic way (Waring, 1996).

CHAPTER TWO

SAFETY & HEALTH MANAGEMENT

CHAPTER TWO
Safety and Health Management

2. INTRODUCTION

The common complaint over the past 20 years is that many organisations treat health and safety as an unwelcome alien imposition which interferes with the 'real' management of the organisation (Waring, 1996). It is seen by both management and staff as uninteresting and not their concern compared with their main objectives of staying in business, making a profit, increasing their market share and reducing operating costs (Stranks, 1994).

The establishment and maintenance of a healthy and safe work environment for all employees is now generally accepted, as not only desirable, but a necessary component of a contemporary human resource management approach. Strategic approaches in health and safety, as in other human resource management areas, help to ensure that occupational health and safety issues are paramount in the minds and plans of senior managers (Garavan, 1997). Furthermore, improved safety means lower compensation costs and lower insurance premiums means increasing costs for the company (Häkkinen, 1995).

2.1. HEALTH AND SAFETY LEGISLATION

The law on health safety at work has, like much protective legislation, developed in a fragmented way over the last two centuries and in many cases, its growth has been brought about as a result of public response to accidents and disasters (Stranks, 1997).

2.1.1. European Union (EU) Influence on Health & Safety Legislation

There exists a wide range of ancillary legislation that contains provisions relating to health and safety at work. Most of this legislation has its origins in EU directives. The EU has been very active in recent years in enacting or proposing directives in a wide range of work areas. These directives are then implemented by member states.

In 1986, the Single European Act (SEA) was adopted which brought in 'Qualified Majority Voting' (QMV). This allows for the allocation of votes to various member states. Member states cannot veto power over directives and are therefore subject to political inclinations and standards adopted by all EU countries, thereby progressing towards unified laws within the EU (Ridley & Channing, 1999).

The implementation of effective common health and safety standards is considered conducive to attaining a 'level playing field' for employers across the community. An example of this is the 'Framework Directive' (EC Directive No. 89/391/EEC adopted 12.6.89 with five daughter directives) (Ridley & Channing, 1999).

2.1.2. UK Legislative History

Early factory legislation in the 19th century, concerned with textile and allied industries, was directed towards the protection of young persons and women and was motivated by the concern for moral welfare and sanctions as much as safety. The Factories Act, 1937 brought together health, safety and welfare in all factories which was repeated in the Factories Act, 1961, where some of the provisions and standards were outdated. By 1970, many organisations, especially Trade Unions, were questioning whether the existing legislation was either sufficient or effective in providing proper protection for people at work (Ridley & Channing, 1999).

2.1.2.1. Robens Report

In 1970, the Robens Committee was established to review the provision made for the safety and health of persons in the course of their employment and to consider whether any further steps were required to safeguard members of the public from hazards (other than general environmental pollution arising in connection with activities in industrial and commercial premises and construction sites). The main objective of the committee was the creation of a more unified and integrated system for the effectiveness of the state contribution to safety and health at work (Robens, 1972). The main weaknesses highlighted by the committee were:

- Reliance on state regulation and not enough reliance on personal responsibility and voluntary effort.
- Existing law unsatisfactory and incomprehensible.
- Existing provisions concerned with physical circumstances. Attitudes, capacities and performance of people and the efficiency of the organisational systems not adequately reflected in the legislation.
- Fragmentation of administrative jurisdictions as they do not coincide to provide a clear comprehensive system of official provision for safety, health and welfare at work to be replaced by one act applying to all persons at work.

There was therefore need for a more effective self-regulating system i.e. organisations set their effective standards and controls. These recommendations were incorporated into the Health and Safety at Work Act, 1974 (Robens, 1972).

2.1.2.2. Health and Safety at Work Act, 1974

The 1974 Act makes provision for protecting others against the risks to health and safety from the way in which work activities are carried out. This act also established a co-ordinating enforcement authority - the Health and Safety Commission (HSC). The Health and Safety Executive (HSE) was also established and is responsible for implementing HSC policies. The 1974 Act is an enabling act which allows for the drafting of regulations. The 1989 EU Framework directive and daughter directives, led to the introduction of the 'six-pack' regulations of 1992 (Management of Health and Safety at Work Regulations, 1992). These regulations include management, work equipment, display screens, manual handling, personal protective equipment (PPE) and health, safety and welfare (Ridley & Channing, 1999). These 1992 regulations brought in a totally new management-orientated approach to health and safety law, including the duty on employers to take account of 'human capability' as regards health and safety when entrusting tasks to their employees. The employer is also required to make suitable and sufficient assessment of the risks of their premises (Stranks, 1997).

The HSC has the power to approve codes prepared by bodies other than themselves. An approved code is a quasi-legal document. It is not legally binding, however it is accepted as documentary evidence of a means to conforming with legislative requirements. An example of an Approved Code of Practice (ACoP) is 'The Control of Substances Hazardous to Health Regulations, 1994' (COSHH). To supplement the ACoPs, the HSE issue guidance notes, e.g. HS (G) 65 - Successful Health and Safety Management. ACoPs have no legal status and are purely of an advisory nature (Stranks, 1997) but they do allow for greater flexibility to the design or amendment of statutorily recognised standards which in turn allow for rapid changes in order to keep pace with new hazards introduced by rapidly advancing technologies (Ridley & Channing, 1999).

Legislation now requires a more flexible proscriptive approach which allows individuals, (including employers), to determine how best, within their trading and employment situation, they can achieve the desired end results (Ridley & Channing, 1999).

2.1.3. Irish Legislative History

During the last decade, health, safety and welfare issues have been highlighted by the development of comprehensive legislation in Ireland. The costs of accidents at work and disease, both physical and psychological, incurred as a result of work activities, have begun to be calculated in terms of medical and hospital costs, time lost, replacement costs, rehabilitation and workers' compensation payments, retirement and superannuation entitlements (Garavan, 1997).

The Factories Act, 1955 represented the first significant attempt at the statutory regulation of health and safety in Ireland. The act covers three main areas - duties with regard to the condition of the factory, factory duties to protect people from dangerous machinery and the lifting of weights. It had, however, a restricted range of application. The Mines and Quarries Act, 1965 regulates the health, safety and welfare of employees who work in mines and quarries. The majority of its provisions are qualified by the criterion of practicability. The Office Premises Act, 1958, provides for the health, safety and welfare of employees working on office premises and engaged in clerical work. The Health, Safety and Welfare at Work Act, 1989, then evolved and it is now the main piece of Irish statutory health and safety legislation (Garavan, 1997).

Legislation, before the 1989 Act, did not specify strongly or in a sufficiently clear manner, the responsibilities of the parties. It was not possible to extract a set of general underlying principles that could be applied to all sectors and there was little emphasis on a preventative philosophy (Garavan, 1997). The origins of the 1989 Act can be traced to the recommendations made by the Barrington Commission (Report of the Inquiry on Health, Safety and Welfare at Work) in 1983 (similar to the Robens Report in the UK).

2.1.3.1. Barrington Commission

This was a comprehensive report and highlighted many weaknesses in our system of occupational health and safety (Garavan, 1997). The purpose of the Commission was to examine the entire system of health, safety and welfare at work which included an examination of the legislation and activities which impinge on health, safety and welfare of people at work. The principles on which effective safety systems should be based were examined (Barrington, 1983). The weaknesses highlighted by the inquiry were:

- Absence of a systematic, comprehensive and rational approach to occupational health and safety.
- Narrow focus exclusively on factories, mines, quarries, construction and shops.
- Some provisions of the Safety in Industry Act, 1980, did not work effectively in practice.
- The safety statement, which the Safety in Industry Act, 1980, viewed as key mechanism for policy formulation and the encouragement of management accountability was unsuccessful (Barrington, 1983).

The inquiry also recommended that a National Authority for Occupational Safety and Health be established which would have the power to draw up and issue 'codes of practice' and guidelines (Barrington, 1983). This in turn led to the establishment of the Health and Safety Authority (HSA) in 1986. This then gave way for the introduction of the Safety, Health and Welfare at Work Act, 1989.

2.1.3.2. Safety, Health & Welfare at Work Act, 1989.

The 1989 Act is a comprehensive piece of legislation detailing all principles of safety management. It envisages the safety statement as a fundamental component of the management of the health, safety and welfare process within the workplace which incorporates many of the criticisms of the Barrington Commission report and essential philosophy of the EC 'Framework' Directive. The 1989 Act contains nine sections and five schedules which include duties of employers, employees (including the appointment of a safety representative), designers and manufacturers.

The 1989 Act makes provisions for inspectors and their role in safety enforcement and management, as well as the power of the authority to conduct investigations into particular incidents and accidents. The safety statement, one of the key elements of the 1989 Act, specifies the manner in which the health, safety and welfare of all employees should be managed. It is based on the Risk Assessment Principle - the identification of hazards, assessment of the risks and the control measures required for implementation (Garavan, 1997). The duties contained in sections six to eleven of the 1989 Act are subject to the limitation that employers and others are required only to do what is 'reasonably practicable' (Byrne, 1997).

2.1.3.3.Safety, Health & Welfare at Work (General Applications) Regulations, 1993

The General Applications Regulations, 1993 are a framework to compliance and safety management which further amplify the 1989 act. They must be viewed in the context of

the Safety, Health and Welfare at Work Act, 1989. They provide more detail in certain issues, (consultation, training, information, manual handling and PPE). For example - the General Applications Regulations, 1993 further amplify risk assessment requirements in regulations 5 and 10. There is a requirement to have a written risk assessment which means employers will therefore have to produce appropriate documentation which supports the risk assessments that have been carried out. This requirement is designed to reinforce the notion that writing a safety statement is not enough; it must be regularly updated to reflect the changing conditions within the organisation (Garavan, 1997).

2.2. SAFETY MANAGEMENT

Safety management in organisations has come under considerable scrutiny by both regulatory agencies and employers in light of various disasters and developments in safety legislation. For example, the inquiry into the Piper Alpha Disaster of 1988 sparked off new offshore safety regulations around the world which require operators and contractors to establish and maintain adequate safety management systems (SMS). In the EU, the requirement for employers to have an effective SMS is now a general one (Waring, 1996).

The principle aim of safety management is to intervene in the accident causation process and to break the causation chain. This involves preventive or detecting latent failures (failures which lie dormant in the organisation) and active failures (failures which have immediate effect) in the continuing process of hazard identification, risk assessment and control (Booth & Lee, 1995). Medical active failures may be committed by those in direct contact with the patient while latent failures occur within the higher echelons of the institution, in the organisational and management spheres (Vincent, 1995).

The past two decades have seen a significant number of large-scale disasters in a wide range of hazardous, well-defined technologies. Despite their differences, the root causes of these accidents have been traced to latent failures and organisational errors arising in the upper echelons of the system in question (Reason, 1995).

Safety management is concerned with the effective use of safety measures in the pursuit of specified safety goals. Organisations that are successful in achieving high health and

safety standards are structured and operated so as to put their policies into effective practice. This is helped by the creation of a positive culture which secures involvement and participation at all levels. The visible and active leadership of senior managers is necessary to develop and maintain a culture supportive of health and safety management (Garavan, 1997).

Many of the features of health and safety management are analogous to the sound management practices advocated by components of quality management, environment protection and business excellence. Commercially successful companies often excel at health and safety management as well, precisely because they apply the same business enterprise to health and safety as to all other aspects of their operations (HSA, 1999a).

2.2.1. Safety Management Systems (SMS)

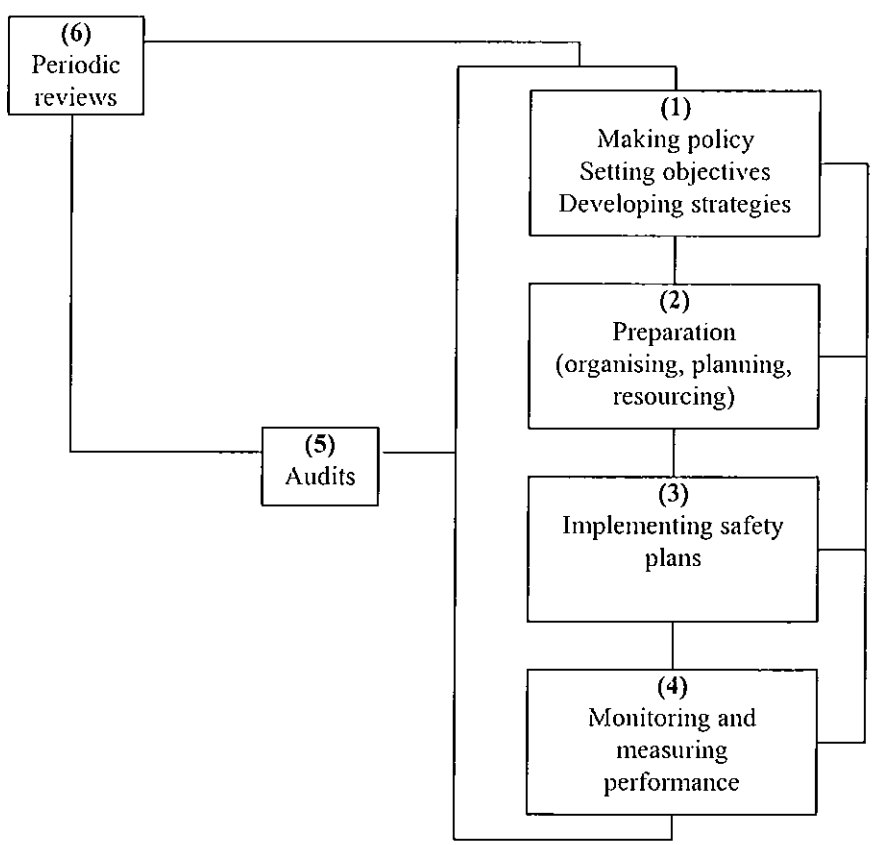
A safety management system is described as

"A structural and systematic means for ensuring that an organisation, or defined part of it, is capable of achieving and maintaining high standards of safety performance"

(Waring, 1996).

Figure 2.1

A systematic Presentation of the SMS process (Adapted from Waring, 1996).



1. Safety Policy, Objectives and Strategy

Key aspects of safety policy define management's commitment to safety and demonstrate that sound health and safety standards are a key objective. This means that such a policy should be integrated to all other management activities and strategies and would therefore be managed as any other strategy vital to the business. A safety policy, in order to be most effective, needs to be underpinned by a culture that promotes effective health and safety procedures (Garavan, 1997). Safety strategy emanates from policy and objectives. The strategy represents the focus of attention and efforts over a defined period of time and determines much of the organising, planning and resourcing requirements (Waring, 1996).

2. Organising, Planning and Resourcing

Responsible safety personnel will need to organise, plan and resource so that those responsibilities can be discharged. Activities in organising, planning and resourcing can include - preliminary risk assessments, identifying objectives, establishing communication etc. (Waring, 1996).

3. Implementing Safety Plans

Risk assessment will be required in all implementation activities. Implementation is a set of different tasks at different levels of complexity carried out at different levels in the organisation. At whatever level, there is usually a need for a project management approach to the implementation of risk controls, especially engineering, organisational, procedural and behavioural controls (Waring, 1996).

4. Monitoring and Measuring Performance

Reactive measures such as accident rates are necessary, but there is a need for a coherent set of measures of safety performance which more faithfully reflects what is going on in the organisation. Such a set of measures needs to point out the contribution of safety performance to organisational and business performance as a whole (Waring, 1996).

5. Safety Auditing

A safety audit is a technique which submits each area of an organisations health and safety activity to a systematic examination with the principal objective of minimising loss. It also aims to disclose strengths and weaknesses in the main areas of vulnerability

or risk. The safety auditing process generally emphasises four areas - safety policies, safety procedures, safety practices and safety programmes. These must form the basis of any effective audit (Garavan, 1997).

6. Periodic Reviews

The most likely reasons for a company to review its SMS are - introduction to a new process or technology, major reorganisation, findings of a safety audit etc. Periodic reviewing is a repetitious process which should continue throughout the lifetime of the organisation.

2.2.2. Examples of Safety Management Systems

Whatever its size, industrial sector or activity, an organisation will need to follow a systematic approach to safety management which addresses the above six process elements. There are, however, multiple ways of arranging the same essential components. Examples of which include HS (G) 65 - Successful Health and Safety Management, 1997 and ISO 14001 (Environmental Management Standard) (Waring, 1996). It is important that systems are developed which integrate with the responsibilities and the business needs of the enterprise (Ridley & Channing, 1999).

2.2.2.1. British Standard (BS) 8800, 1996

BS 8800, 1996 (A Guide to Occupational Health and Safety Management Systems) is a set of guidelines structured to accommodate ISO 9000 (Quality Management and Quality Assurance Standard) and ISO 14001, and offers the opportunity for companies who have adopted ISO 9000, to integrate environment and health and safety into the one comprehensive management process (Ridley & Channing, 1999).

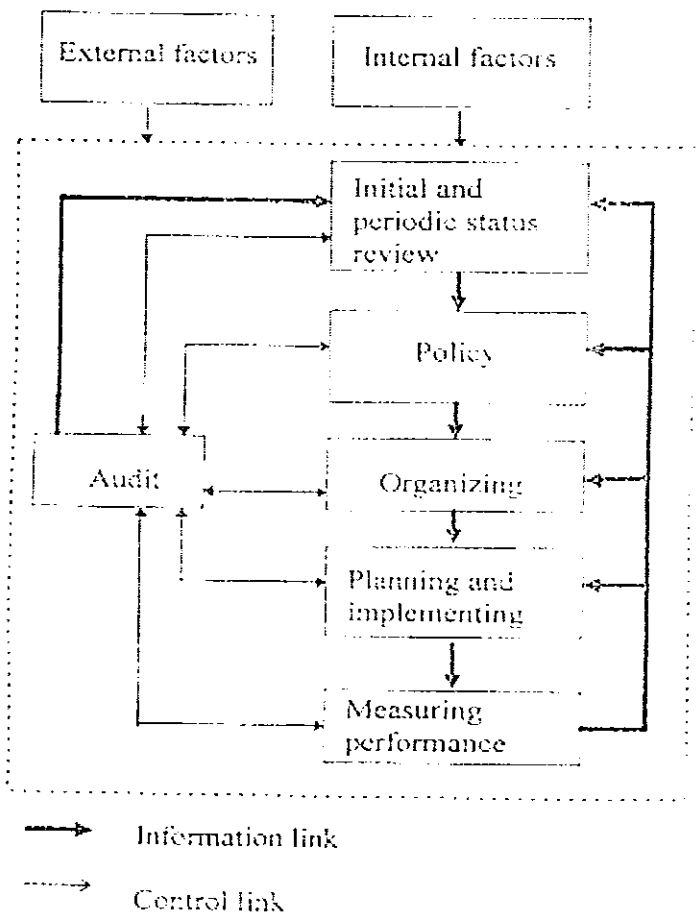
BS 8800 presents two alternative approaches to occupational health and safety management – (a) HS (G) 65 and (b) ISO 14001 and allows organisations to choose a model which is best suited to their own specific needs and existing systems. The commonalties between ISO 14001 and BS 8800 are policy, planning, implementation and operation, checking and corrective action and management review (Smith, Hunt, Green, et al (1998).

(a) HS (G) 65 - Successful Health and Safety Management

This was first prepared by the HSE's Accident Prevention Advisory Unit in 1991 as a practical guide for directors, managers, health and safety professionals and employee representatives who wanted to improve health and safety in their organisations (HSE, 1997c).

Figure 2.2

HS (G) 65 - Successful Health and Safety Management



1. Initial and Periodic Status Review

An initial status review of the existing arrangements for managing occupational health and safety should be considered. The review should be made to provide information that will influence decisions in the scope, adequacy and implementation of the current systems as well as providing a baseline from which progress can be measured (BS 8800, 1996).

2. Policy

The organisations' most senior management should define, document and endorse its occupational health and safety policy. The policy demonstrates a commitment to

reorganise occupational health and safety as an integral part of its business performance, provide adequate and appropriate resources to implement the policy, set occupational objectives etc. (BS 8800, 1996).

3. Organising

Ultimate responsibility for occupational health and safety rests with senior management who should demonstrate commitment by being actively involved in the continual improvement of occupational health and safety performance. The organisation should have occupational health and safety knowledge, skills and experience to manage its activities safely, allocate responsibilities and resources, make effective arrangements for employee involvement and consultation etc. All records should be maintained to demonstrate compliance with legal requirements (BS 8800, 1996).

4. Planning and Implementing

This involves identifying occupational health and safety requirements, defining what has to be done, who is responsible etc. The organisation should carry out a risk assessment of the premises and identify legal requirements. Management should make arrangements for operational and contingency plans in the case of an emergency (BS 8800, 1996).

5. Measuring Performance

This is the key way to provide information on the effectiveness of the occupational health and safety management system. It is a means of monitoring the extent to which policy and objectives are being met and industries proactive and reactive measures of performance. Where deficiencies are found, root causes should be identified and corrective action taken (BS 8800, 1996).

6. Audit

In addition to routine monitoring of occupational health and safety management performance, there is a need for periodic auditing of all the elements of the occupational health and safety management system. These should be conducted by competent persons. Audits should be tailored to the size of the organisation and the nature of its hazards. Results and corrective action should be communicated to all relevant personnel (BS 8800, 1996).

7. Periodic Status Review

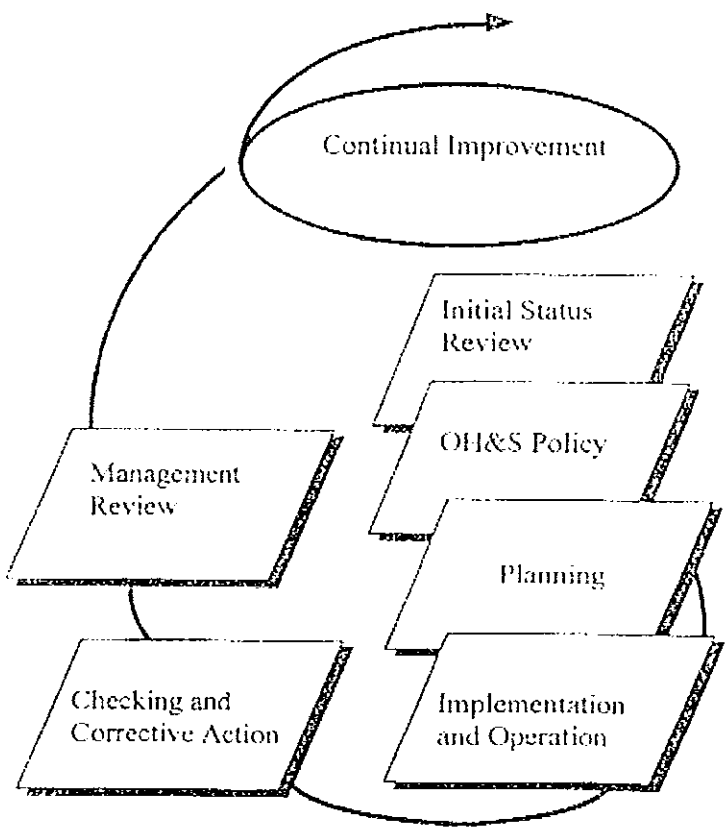
This should consider the overall performance of individual elements of the occupational health and safety management system, the findings of audits and internal and external factors (BS 8800, 1996).

(b) ISO 14001 Environmental Management Standard

Environmental Management Systems (EMS) have been developed since the early 1970's in both chemical and heavy manufacturing industries. The purpose of the EMS is to assess compliance with environmental legislation and to identify environment and health risks. The ISO 14000 series followed development of an earlier British Standard, BS 7750 for Environmental Management and Auditing Systems (Winder, 1997).

Figure 2.3

ISO 14001 Environmental Management Standard



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This involves identifying occupational health and safety requirements, defining what has to be done, who is responsible etc. The organisation should carry out a risk assessment of the premises and identify legal requirements. Management should make arrangements for operational and contingency plans in the case of an emergency (BS 8800, 1996).

4. Implementation and Operation

Ultimate responsibility for occupational health and safety rests with senior management who should demonstrate commitment by being actively involved in the continual improvement of occupational health and safety performance. The organisation should have occupational health and safety knowledge, skills and experience to manage its activities safely, allocate responsibilities and resources, etc. Organisations should make arrangement to identify the competencies required at all levels within the organisation and organise any necessary training. Arrangements for effective communication of the occupational health and safety information. Provision of specialist advice and employee involvement should be made (BS 8800, 1996).

5. Checking and Corrective Action

This is the key way to provide information on the effectiveness of the occupational health and safety management system. It is a means of monitoring the extent to which policy and objectives are being met and industries proactive and reactive measures of performance. The organisation should maintain all records. These demonstrate compliance with legal requirements. In addition to routine monitoring of occupational health and safety management performance, there is a need for periodic auditing of all the elements of the occupational health and safety management system. These should be conducted by competent persons. Audits should be tailored to the size of the

organisation and the nature of its hazards. Results and corrective action should be communicated to all relevant personnel (BS 8800, 1996).

6. Management Review

This should consider the overall performance of individual elements of the occupational health and safety management system, the findings of audits and internal and external factors (BS 8800, 1996).

2.2.2.2. OHSAS 18001 Occupational Health and Safety Management System, 1999

The British Standards Institute has recently published OHSAS 18001 (Occupational Health and Safety Management Systems – Specification) – another example of a safety management system. This is a recognisable specification for the assessment and certification of occupational health and safety management systems. It is compatible with ISO 9000 and ISO 14001 as an aid to organisations that wish to integrate their occupational health and safety management systems. OHSAS 18002 (Occupational Health and Safety Management Systems – Guidelines for the Implementation of OHSAS 18001), a non-British standard, addresses the following issues:

- General requirements
- Occupational health and safety policy
- Planning
- Implementation and operation
- Checking and corrective action, and
- Management review

OHSAS should then should assist organisations to utilise hazard identification, risk assessment and risk control to gain knowledge regarding all significant health and safety hazards that affect them.

2.2.2.3. Management Systems in General

Examples of other management systems, which are similar to SMS's include ISO 9000 and Total Quality Management (TQM). The ISO 9000 series originated in 1979 when the British Standards Institute submitted a proposal to the International Standards Organisation for the development of an international standard for quality systems. The first edition of ISO 9000 was published in 1987. The requirements of ISO 9000 standards are drawn from the customer's perspective (Winder, 1997).

Many forward looking companies are adopting strategies to achieve 'business excellence' and 'world class performance' through the use of TQM to develop and support an integrated approach to business management (Osborne & Zairi, 1997). TQM includes the application of quality assurance to every company activity and is characterised by the application of good practice, quality management principles, practices and techniques. TQM is generally associated with the terms 'zero defects', 'plan, do, check, action', 'fitness for use' etc. and implies an open management style with devolution of responsibility. The aim is to develop a quality culture whereby everyone in the organisation shares commitment to continuous improvement aimed at customer satisfaction (Wilkinson & Redman, 1998). Total organisational excellence will influence the culture and provide a vision framework comprising its guiding philosophy, core values and beliefs, a purpose and a mission (Oakland, 1999). Organisations where health and safety performance is perceived to be more critical to the overall success of the business, e.g. chemical industry, tend to be more advanced in the application of TQM to the management of health and safety (Osborne & Zairi, 1997).

Many integration systems adopt one of the ISO or British Standards (ISO 14001, ISO 9000, BS 8800, HS (G) 65 etc.) as a tool for integration. OHSAS 18001 can now be considered as a tool for integration also. Dyjack, Levine, Holtshouser, et al, (1998), demonstrated that management tools chosen, although structured differently, are not statistically dissimilar in content. Some companies adopt a TQM approach (e.g. BS 8800), however, ISO 14000 provides the most useful framework for developing and implementing an integrated system as it is risk based (Winder, 1997).

2.3. INTEGRATION OF MANAGEMENT SYSTEMS

Integration is based on the principle of the control of risks imposed by business activities to the lowest possible level. The adaptation of the health, safety, environment and quality management systems approach represents a logical progression for most companies (Fishwick & Bamber, 1996). For example, the Institute of Chartered Accountants in England and Wales has recently produced a code for managing risks entitled 'Internal Control: Guidance for Directors on the Combined Code', 1999. These risks include those relating to safety and the environment as well as general business risks. Since quality, safety and environmental protection are analogous and closely

linked outcomes of safety management activity, it is argued that systems for them need to be integrated (Waring, 1996).

The object of integrating safety, environment and quality management systems is to achieve a 'unity of purpose', i.e. a unity of standards and philosophy at or above the lowest common denominator. This lowest common denominator has to be that of compliance with legislative and regulatory requirements (Shillito, 1995).

Successful integration of safety, environment and quality (SEQ) management into the core processes of an organisation requires an understanding of the forces involved at a system level, at a team level and also at a level of an individual's motivation towards change (Ramsey, 1998).

The Association of Insurance and Risk Managers (AIRMIC) in the UK have produced a document (1999) entitled 'A Guide to Integrated Risk Management' which advocates the integration of risk management into the management structure in the organisation. AIRMIC believe there are three strands to ensuring integration. These are as follows:

- Undertaking an approach that considers all types of risks
- Ensuring risk management is part of business planning, and
- Evaluating risks when considering business opportunities.

An important reason for weak implementation of integrated risk management lies in the fragmentation of the various disciplines and professions which engage risk management. It will remain difficult to integrate the various potential components until there is a common understanding of the scope of the whole subject, a common technical language, communication between areas and motivation among parties to integrate their respective disciplines (Waring & Glendon, 1998).

Internal customers (e.g. workers) require work environments that are safe, healthy and environmentally benign. External customers require products and services that are safe and present no negative environment consequences. Rahimi, (1995), therefore suggests that long range safety planning should be integrated into TQM efforts to form strategic safety management (SSM). The SSM approach is only successful if it is built on a strong management belief within an overwhelming employee acceptance.

A consequence of integrating individual management system components is one of a negative organisational culture. If there is a negative 'environmental' culture for example, this may transfer to other individual management system components upon integration. Participants in the integration process may therefore feel uncomfortable dealing with uncertainty. Individual participant attitudes and behaviours in all individual management system components must therefore be assessed to allow for successful integration (IOSH, 1997; De Rosie, 1998).

There are a number of reasons why integration of management systems may be difficult:

- Increase in the complexity of the system
- Tensions may be created between specialists on certain topics
- Integration will have a detrimental effect on occupational safety and health performance
- Specialists will need further training in other areas
- During implementation the organisational structure will be very vulnerable
- Professional / organisation rivalries may occur – impair collective operation of the system (e.g. environmentalists doing a quality audit)

(Haimes, 1991; IOSH, 1997; Ross, 1998)

Integrated Risk Management can be beneficial for the following reasons: uniform strategic decision making, uniform resource allocation (i.e. more cost-effective), uniform auditing, achievement of designated performance standards, risk assessment can be carried out in separate disciplines and there is less duplication of effort (IOSH, 1997; Ross, 1998; Winder, 1997). The international standards organisation (ISO) have recognised this and a have produced a document entitled 'Guidelines on Quality and Environmental Auditing', 1999 which states: *"Although the scope of this document is limited to quality and environmental management systems audits, and does not specifically address other types of audits, the user may consider extending or adapting the guidance provided to apply to other types of audits."*

The two disciplines of environmental management systems and occupational health and safety diverge in many ways. One of the basic prerequisites for integration is that there is a need for a valid business case. Motivators for environmental management systems are more positive (customer satisfaction and cost savings) and this breeds a proactive approach and attitude. Motivators for occupational safety and health are more negative - legislative compliance and avoidance of prosecution being the main motivators. The

main advantages of integrating environmental management systems and occupational safety and health management systems is that motivation for occupational safety and health is greatly increased due to spin offs from the ISO 14001 systems which generate an additional pressure for occupational safety and health improvement (Baird, 2000).

There is no general recipe for integration. It will vary in all organisations. Success will depend on innovation, not imitation. Business managers can be helped in their hunt for excellence by three core tools:

- Models and systems thinking
- The risk concept
- Management systematics and benchmarking

The exploitation of these tools helped organisations to explore alternative ways of progressing towards business excellence and to prioritise their options (Ramsey, 1998).

2.4. RISK MANAGEMENT IN THE HEALTH CARE SECTOR

Integration of management systems in the health care sector is now emerging in the UK. Until recently, when the term risk management was used in the healthcare sector, it was generally used in the context of "a process which identifies accidents or other untoward incidents which put a patient's safety at risk. It aims to reduce those risks with a consequent improvement in patient care and reduction in clinical negligence claims" (Cusack, 1994). Vincent, 1995, describes risk management primarily as the protection of the hospital from claims, and on larger scale, an approach to improving the quality of care which places special emphasis on occasions on which patients are harmed or disturbed by their treatments. Doctors and other members of staff may be initially hostile to risk management, viewing it as an easy way for hospital management to point the finger of blame and individuals and departments (Cusack, 1994). The term 'risk' therefore generally referred to clinical risk.

2.4.1. Integrated Risk Management in the Health Care Sector

Risk management in the health care sector should also include non-clinical risk (Roberts & Holly, 1996). The Health and Safety Advisory Committee (HSAC) recognised this, and took a step closer to integration in its report entitled 'Management

of Health and Safety in the Health Services: Information for Directors and Managers', 1994'.

2.4.1.1. HSAC - Management of Health and Safety in the Health Services

The UK HSAC publication 'Management of Health and Safety in the Health Services: Information for Directors and Managers', 1994, confirms that effective management of health and safety, seen as an integral part of the corporate management process, is cost beneficial (Figure 2.4). Accidents, whether to staff, patients or visitors, cases of occupational ill health, damage to plant and equipment or loss of productive facilities, all represent costs to NHS Trusts. Trust managers generally appreciate the very large costs involved in dealing with clinical negligence and effective management programmes have been put in place to manage such claims. Less well understood, however, are the nature and extent of loss due to accidents or ill health to staff. Such costs can often be hidden in sick pay, increased insurance premiums or maintenance budgets, the loss of trained and experienced staff and low staff morale.

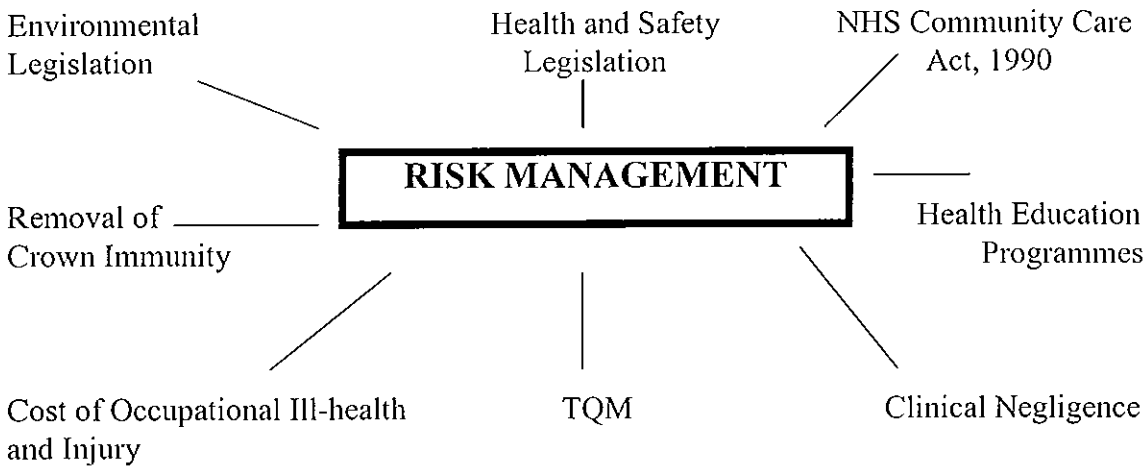
While there is a clear moral imperative about securing the health and safety of people at work, particularly those in the 'caring' professions, the law also requires a legal duty to safety and health. With the removal of Crown Immunity, in the UK, in 1991, all NHS activities were subject to the full impact of health and safety legislation.

The allocation of clear responsibilities to appropriate post holders for the delivery of health and safety programmes can assist in defining the levels and quality of service provision required, including those relating to standards of health and safety performance. Increasingly, for example, clinicians are accepting key operational management posts and are thus facing up to the challenge of integrating health and safety management into these functions. Lessons learned from the management of clinical negligence claims have clear parallels in the field of health and safety management where prompt and efficient remedial action can also reduce costs. Risk management in health care has now taken a step further with the development of the Controls Assurance Project.

Figure 2.4

Factors Affecting Health & Safety Risk Management within the Health Care Sector

(Adapted from HSAC, 1994)



2.4.1.2. Controls Assurance Project

Controls Assurance Project requires the NHS Executive to produce a statement covering wider organisational controls (including risk management and organisational controls covering non-financial and non-clinical risk areas) within their annual financial control statements. Controls assurance is a holistic concept based on best governance practice. It is a process designed to provide evidence that the NHS organisations are doing their 'reasonable best' to manage themselves so as to meet their objectives and protect patients, staff, the public and other stakeholders against risks of all kinds over a five year period.

The NHS has embraced the principles of good governance through its complementary corporate governance and clinical governance initiatives. Clinical governance provides a framework within which local organisations can work to improve and assure the quality of clinical services for patients. Implementing and maintaining effective risk management and organisational controls is fundamental to ensuring the success of clinical governance. Corporate governance is described as the system by which companies are directed and controlled (NHS Executive, 1999).

One of the key objectives of the NHS Executives Controls Assurance Team is to ensure the task is made less onerous through the development of a comprehensive 'control framework'. This framework is based on the 'Australia / New Zealand Standard 4360:

1999 Risk Management' and it includes risk management and organisational controls, standards and assessment criteria and benchmarking tools. The AS/NZ: 1999 standard provides a generic non-prescriptive standard for managing any type of risk in any organisation. The principles outlines in the standard are universal and can be applied in any health care risk management context - financial, organisational or clinical. The core standard also integrates 17 other standards which are as follows:

1. Buildings, land, plant and non-medical equipment
2. Catering and food hygiene
3. Contracts and contractor control
4. Emergency preparedness
5. Environmental management
6. Fire safety
7. Health and safety
8. Human resources
9. Infection control
10. Information management and technology
11. Medical equipment and devices
12. Medicines management
13. Professional and product liability
14. Records management
15. Security
16. Transport
17. Waste management

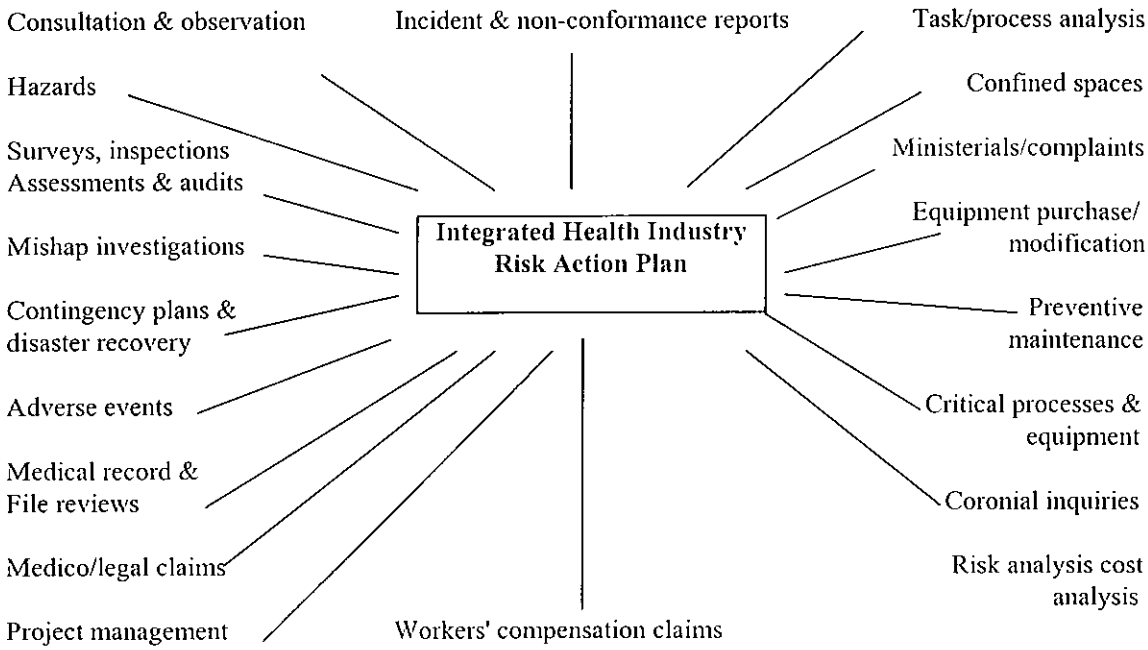
The benefits of the controls assurance project are as follows:

- Reduction in risk exposure through more effective targeting of resources to address key risk areas;
- Improvements in economy, efficiency and effectiveness resulting from a reduction in the frequency and /or severity in incidents, complaints, claims, staff absence and other loss;
- Demonstrable compliance with applicable laws and regulations;
- Enhanced Reputation through public disclosure of achievements in meeting objectives and managing risk; and, consequently,
- Increased public confidence in the quality provided by the NHS (NHS Executive, 1999).

A similar system was also developed in a health service board in Australia, in 1998. This system was designed to enhance performance and resource management. An integrated health industry management model (Figure 2.5) was developed to show that integration was a viable option where processes share common features such as incident management, contract management and change management.

Figure 2.5

Health Industry Risk Management Action Plan



2.5. CONCLUSION

Adherence to safety practices is progressing from a prescriptive legislative approach to one of self-regulation. Organisations are now assessing the level of risk in their organisations and implementing management systems to regulate these risks. Legislative enforcement requires adherence to minimum standards whereas, self-regulation encourages standards of excellence. The Controls Assurance Project in the UK has taken this one step further by integrating all risk management systems, thus making the organisation more accountable to its stakeholders and demonstrating commitment to the public. The CAP incorporates both clinical and corporate governance and aims to manage all aspects of risk under one umbrella entitled 'risk management'.

CHAPTER THREE

HAZARDS IN THE HEALTH CARE SECTOR

CHAPTER THREE
Hazards in the Health Care Sector

3. INTRODUCTION

In order to identify key risk areas in the health care facility, a literature search of hazards in the health care sector was carried out. The health care sector has both intrinsic hazards and those which are common with other industrial sectors. The manual handling of loads can lead to back injury, to which nurses are most susceptible. Health care workers can also be exposed to hepatitis B, C, Tuberculosis and HIV. Substance abuse (alcohol and drugs) among doctors is well documented as a cause of increased suicide rates and stress. Noise and aggressive patients can be hazardous to administrative employees (Estryn-Behar & Cheikh, 1999). For the purpose of this chapter, the author has focused on the intrinsic hazards associated with health care workers in the health care sector.

Research projects and data collected on health care sector hazards, in Ireland and the European Union, to date include 'The Report of the Advisory Committee on Health Services Sector to the Health and Safety Authority, 1992' and 'The Working Conditions for Hospitals in the European Union, 1995'.

The Report of the Advisory Committee on Health Services Sector to the Health and Safety Authority, 1992:

This report focuses on the health services sector prioritising areas for attention and recommendations for occupational safety and health personnel. Irish Public Bodies Mutual Insurance Ltd. (IPBMI) assisted the Advisory Committee by providing data on a sample of over 2,000 claims by employees against the health boards during the period of January, 1984 to December, 1990. Data was sought from five health boards and nine hospitals on reported occupational accidents resulting in absence from work for three days or more, other recorded accidents, occupational illnesses resulting in absence from work for three days or more and the total numbers of days lost from work as a result of these. The results found indicated the causes of reported accidents were attributed to slips, accounting for 19% of accidents, lifting and handling, 18%, assaults, 11% and 'sharps' injuries, 10%.

'The Working Conditions for Hospitals in the European Union, 1995'

This report surveyed eight health boards in Ireland (38,000 staff) and the public health services sector (60,000 staff) - entitled 'Working Conditions for Hospitals in the

European Union' from the period 1989 to 1993. IPBMI also assisted in the collection of data for this report. The health boards (representing over 50% of all employees in the hospital sector) reported 2,250 accidents over the period of five years, 1989-1993. The greatest causes of reported accidents were slips, accounting for 19% of accidents, lifting, 19%, electrical injuries, 18% assaults, 11% and sharps injuries, 11%.

For the purpose of this chapter, hazardous activities in the health care sector have been examined under headings of: Physical, Chemical, Biological, Human Factor and Fire.

3.1. PHYSICAL HAZARDS

30% of accidents in the Health and Social Work category of the HSA 1999 Annual Report were attributed to handling, lifting and carrying. 8% of reported accidents were due to slips, trips and falls on the same level (HSA, 1999c).

Singleton, Ludbrook, Webb, et al, (1993), highlights the analysis carried out by the Australian Incident Monitoring Study (AIMS), where 3% of the first 2000 incidents reported to AIMS were physical hazards. Examples of these included accidental lacerations to the patient, patients falling from transport trolleys and patients falling from beds when being transferred due to poor communication by employees.

3.1.1. Musculoskeletal Injuries

Health care sector employee injuries, reported to the HSE between 1992 and 1995, were due to manual handling accidents and over 60% of these involved the handling of patients (HSC, 1998). Nurses are identified as being most at risk from occupational lower back pain because they are over-worked (Pheasant & Stubbs, 1992). A study carried out by Tamminen-Peter & Wickström, (1999), demonstrated that continuous physical exhaustion appeared to be an important occupational factor for predicting back pain symptoms two years later. However, nurses tend not to cite 'lifting' as a hazardous task among their daily duties (Jones, Cockcroft, Richardson, et al, 1999).

The European Foundation Report – Working Conditions in Hospitals in the European Union (1995), highlighted musculoskeletal injuries as the main risk factor in nine countries. One of these studies, carried out in Greece, found 80% of nurses move or transfer patients at least once a day and 15% of nurses manipulate heavy objects at least

six times a day. A similar study in Spain, showed that 54% of nurses and 50% of ward attendants suffer from back pain which results in absenteeism.

St-Vincent, Tellier, Petitjean-Roget, et al, (1999), analysed 944 employee accident report forms from 3 hospitals in Canada and concluded that most manual handling accidents were not due to lifting but transferring. Effort-related accidents fell into two main categories – transfer accidents (46%) and in-place handling accidents (31%). Transfer accidents were mainly due to bed-chair transfers (37%) and chair-bed transfers (28%). Injuries during lifting were reported in 19% of cases when the patient was being transferred due to weakness (355), resistance (23%) and patients moving unexpectantly (19%).

In a similar study carried out in Hong Kong, 81% of respondents reported having suffered from back pain during their nursing career. The category of less than two years' working experience had the highest prevalence of back pain (100%). 13% of nurses suffered from back pain daily. Activities contributing to back pain were divided into two categories – dynamic and static. Transferring the patient was the most frequent factor in the dynamic category and 'stooping was the most frequent factor in the static category French, Fung Wah Flora, Sum Ping, et al, (1997).

Smedley, Egger, Cooper, et al, (1997), reported that the risk of back pain in the nursing profession was higher in nurses who frequently manually transfer patients between the chair and bed and who manually reposition the patients in bed or lift patients in and out of the bath with the hoist. Earlier history of back trouble was found to be the best predictor of new symptoms for back pain and the only way to improve the situation was to improve ergonomic issues.

Manual handling problems are further increased by poor communication between handlers, surgical restraints which may complicate the transfer of the patient and failure to apply brakes to the transfer surface (therefore increasing the risk of moving during transfer operations, thus increasing the risk of an accident occurring) (Coleman, & Brooke, 1999).

Reasons for Incorrect Manual Handling Procedures

In a UK study, 26 nurses from two similar wards were interviewed to estimate nurses' perceptions to manual handling in the health care environment. Factors which caused incorrect manual handling techniques included patient handling (e.g. handling was altered to maintain quality of care), families of the patient, (e.g. demanding immediate attention) and management (e.g. negative attitudes to employee shortages – less employees to assist with lifting) and faulty equipment (e.g. wheels or brakes not working properly) (Hignett & Richardson, 1995). Engkvist, Hagberg, Hjelm, et al, (1998), surveyed 130 nurses in a Swedish Hospital. Respondents reported back injuries due to over-exertion. 44% of the cases resulted in sick leave while 55% sought medical care. This study demonstrates that most of the injuries occurred during patient transfer. Respondents claimed manual handling procedures were not always adhered to, because it takes too long and inconvenient, not enough space and not used in emergency situations.

Musculoskeletal Injury Costs

The UK Trades Union Congress (TUC), 1999, estimates that 44 million working days are lost each year by women because of back pain. An investigation into manual handling-related accidents in a NHS Trust in the UK, showed that 6,720 working hours were lost in the period from April, 1993 to March , 1994. 59 manual handling related accidents were reported (11% of all accidents to employees in the Trust). An assessment was then carried out in the Trust. Hoist companies were contacted, equipment was assessed. Handling techniques by employees were observed, training was carried out and changes in policies in the hospital were implemented. The second year showed an 84% reduction in lost hours due to manual handling-related accidents. The Trust had to invest £220,000, but it is estimated to have saved approximately £2m in reduced absence leave (Fazel, 1998).

A nurse received a total of £106,031 in damages due to a serious back injury sustained while lifting patients at work. The hospital had failed to provide a safe system or place of work (Byrne, 1999).

The ergonomic problems that arise in nursing are not exclusive to the nursing profession, but the unique nature of the load, in that it can be different to hold, patients

may be unco-operative and resist movement, alters the way in which nurses and ward attendants handle patients, in order to maintain a quality of care.

3.1.2. Slips, Trips and Falls

One third of people over the age of 65 years, and half of the people over the age of 80 years suffer at least one fall per year. 38% of accidents in Australian hospitals are due to patient falls (Lambert, Wood, Kowoanko, et al, 1998). Patients who fall, tend to have problems with gait, had a history of falling and generally use ambulatory aids (Mc Collam, 1995). Patient characteristics associated with a high risk of falling include age, mental status, a history of falling, medications, impaired mobility and special toileting needs. Patients with more than one risk factor are more likely to fall falls (Lambert, Wood, Kowoanko, et al., 1998).

Wilson, 1998 classified fall risk factors as being physical fall risk factors or environmental fall risk factors. Physical fall risk factors can include advancing age, acute chronic disease, effects of medication (e.g. diuretic and hypnotic drugs, sedatives, etc.), alterations of vision, neurological and musculoskeletal system changes that can affect balance. Environmental fall risk factors can include hospital furniture, including unlocked wheels on beds, bedside tables, beds left in elevated positions. Bed rails do not prevent falls, but can contribute to them when patients try to climb over them.

Increasing the nurse patient ratio does not reduce patient falls. This is evident in a study carried out by Tutuarima, de Haan, Limburg, et al, (1993). The relationship between the risk of falling by stroke patients and the number of nurses on the ward in an acute-care setting was studied. 349 patients were analysed. 14% of these were categorised as 'falling patients' and 35% of these fall occurred within the first week of admission. The greatest number of falls (53%) occurred in the daytime when the patient per nurse ratio (PNR) was at its highest (3.46). Contrary to that, Byers, Arrington, & Finstyen, (1990), discovered falls during the night shift (47%) occurred twice as often as the day shift (29%) and the evening shift (24%).

Intervention Studies to Reduce Patient Falls

A study, carried out in a 36-bed geriatric rehabilitation unit in Canada evaluated the relationship among fall risk, level of independence and interventions. Patients were

categorised into three risk levels. All patients were assessed, by a nurse, physician, occupational therapist and a physiotherapist within 24 to 48 hours of admission. According to the level of risk, intervention protocols were developed to address issues such as supervision, visual alerts, mobility, toileting schedules, medical management etc. A patient could then progress from a higher fall-risk category to a lower fall-risk category (Patrick, Leber, & Scrim, (1999).

Cotsides (bedside rails) are considered to be a form of restraint to the patient to help reduce patient falls, however, there are conflicting views on the subject. Cotsides can be hazardous to the patient as they can cause injury and death by trapping the patients in the bars of the side rails or between the side rail and the mattress (Roy, 1990). It is widely accepted that cotsides are used as a precaution when there are employee shortages regardless of how the patient may feel, but not as a method of protection for the patient (Jehen, 1999). The FDA (1996), reported 102 head and body entrapment incidents from 1990-1995. The majority of these reported involved elderly patients. These involved bedside rails. 68 were deaths, 22 injuries and 12 entrapments without injury occurred in hospitals, private homes and long-term care facilities. (FDA, 1996).

3.1.3. Radiation Exposure

Radiation can cause gene mutation and chromosomal alteration, delay or impair cell division and interfere with metabolic processes. Radiation exposure can be divided into two areas - ionising radiation and non-ionising radiation.

Ionising radiation includes x-rays, fluoroscopies, radioactive isotopes and radioactive implants. Ionising radiation can be toxic to male and female fertility. Radiation induced mutations resulting in genetic effects are possible and prenatal radiation exposure may result in prenatal death or morphologic abnormalities of the developing nervous system or other organ systems and carcinogenic risk to the embryo. Occupational exposure usually results from the scatter of x-ray beams or the emission of gamma rays by patients who are being treated with radionuclides or implants. Health care workers in departments where portable x-rays are taken (operating rooms, emergency rooms, intensive care units) may be inadvertently exposed and inadequately monitored.

Non-ionising radiation is classified by the frequency of hertz and can include ultraviolet, visible (lasers), infrared, radio and microwave frequency and ultrasound. (Shortridge-McCauley, 1995).

3.2. CHEMICAL HAZARDS

A variety of different chemical hazards, which can harm health care employees, are too numerous to mention, therefore, only the most hazardous and frequently occurring incidents associated with these chemicals will be documented.

Employees most at risk from occupational chemical hazards are oncology staff, ward staff, workers in sterilisation units, radiology staff and theatre staff (WHO, 1983). Exposure to chemicals can include contact with various chemicals in the laboratory such as preservatives, fixatives (e.g. methanol, xylene etc.), dyes, or contact with disinfectant agents, epoxy resins used in glues and repair pastes, methylmethacrylate used in orthopaedic surgery and chiropody or dust from plaster of Paris and light-weight fibre casts. Chemicals can also include genotoxic and cytotoxic drugs (antineoplastic drugs and chemotherapeutic agents), reproductive and neuro-toxins and therapeutic drugs such as antibiotics (BMA, 1994; European Foundation, 1995).

3.2.1. Cytotoxic Drugs

Exposure of cytotoxic drugs to nursing personnel can occur during preparation (crushing tablets), priming or changing IV lines, withdrawing needles from injection ports, clearing air from drug filled syringes or IV lines, inadequate waste disposal of cytotoxic drugs (Daly, 1997). Acute symptoms include light-headedness, nasal sores, nausea, hair loss, depressed leukocytes and skin rashes (Rogers, 1997). Cytotoxic may also refer to any agent that may be genotoxic, oncogenic, mutagenic, teratogenic or hazardous in way (American Society of Hospital Pharmacists, 1990).

A study of the effects of antineoplastic drugs was undertaken of an exposed group. Nurses (42) who spent all of their working life in the oncology department, in comparison to the non-exposed group (42) who had never been exposed to such an environment. The exposure effect was evaluated by an analysis of sister chromatid exchanges (SCE) and incidence and structural chromosomal abnormalities (SCA).

Results showed that chromosomal abnormalities occurred to the exposed group and differences were the result of exposure to antineoplastic drugs (Milkovickraus, 1991).

Boyd (1998), having compared questionnaire results with observed practices in a hospital in Australia, found that only 70% of employees observed in administering cytotoxic drugs, competently practised safe administration methods. The number of doses handled and the extent of protection were found to be significantly associated with the number of symptoms (Valanis, Vollmer, Labuhn, et al, 1993).

3.2.2. Waste Anaesthetic Gases

Waste anaesthetic gases which are classified as harmful to theatre staff, anaesthetists and staff in obstetric units, can cause spontaneous abortions (WHO, 1983). These gases contain substances such as nitrous oxides, halogenated ethanes and volatile halogenated hydrocarbons such as halothane, isoflurane and enflurane (BMA, 1994).

Exposure to these gases can occur due to poor ventilation. Anaesthetic gases are delivered to the patient via a face-mask or an endotracheal tube which are later exhaled by the patient (Sass-Kortsak, Purdham, Bozek, et al, 1992). Exposure can also occur due to inadequate design of the equipment, during the induction of anaesthesia or manipulation of the face-mask, leaks from the machine, machines being left on when not in use or when a series of short operations have been carried out (Steven, 1990). Waste anaesthetic gases may also be used in places with inadequate ventilation - e.g. in ambulances or in general wards during painful procedures. Waste anaesthetic gases can affect the recipients level of consciousness, behaviour and perception. Nitrous oxide can cause megablastic anaemia and halothane can cause severe hepatotoxicity. This is rare but can increase with repeated exposure. Enflurane and isoflurane can have immunogenic effects on hepatic tissues (Sass-Kortsak, Purdham, Bozek, et al, 1992; BMA, 1994).

3.2.3. Methylmethacrylate

Methylmethacrylate, used in orthopaedic surgery and chiropody, can give rise to anaphylactic attacks in nursing personnel even when sensitised at low levels. In a study carried out by Gatenby, Le Leu, Hennebery, et al, (1999), exposure to

methylmethacrylate was found due to deficiencies of airflow, control of chemical substances entering the theatre area and the mixing of bone cement.

3.2.4. Mercury

Mercury spills generally occur from broken thermometers and sphygmomanometers. Mercury vapour is readily absorbed by inhalation. Acute mercury poisoning may occur after an exposure to high concentrations of elemental mercury vapour due to spillages of mercury in confined spaces. Symptoms include a cough, chest tightness and shortness of breath. Symptoms of chronic mercury poisoning include headache, tiredness, anorexia, and sleep disorders. This can lead to irritability, excitability, loss of short-term memory and a change in personality such as shyness or loss of self-confidence (HSE, 1996).

A survey carried out by Greaves, 1997, in a London Hospital found that employees did not consider mercury spills to be hazardous and therefore were not reporting the accidents. Employees were surveyed in relation to reactions to mercury spills. The most common action (39%) was to place the mercury in a 'sharps' disposal container. Two employees said that they did not know the policy for handling a mercury spillage, while a qualified employee knew what to do in the event of a mercury spill, but failed to use the policy. A similar study carried out by Camargo Andrade & Raab Glina, (1999), found mercury practices to be unsafe in a Brazilian Hospital. Workers did not know much about mercury or its health effects, cleaning practices and manipulation of mercury were found to be inappropriate and no proper individual or collective measures of control were adopted.

3.2.5. Sterilising Chemicals

Sterilising Chemicals are extremely hazardous. Ethylene oxide is used to sterilise heat sensitive equipment and can also be used as a fumigant, which can cause severe skin burns. The greatest potential for exposure occurs during loading and unloading of sterilisers, transferring freshly sterilised items to an aeration cabinet and changing the tanks (Shortridge-McCauley, 1995). Aldehydes can be used for disinfecting equipment. Formaldehyde for example is used in anatomy departments, pathology departments, mortuaries, the internal hoses of haemodialysis machines and equipment in peritoneal dialysis (BMA, 1994).

3.2.5.1. Glutaraldehyde

One of the most hazardous aldehydes used for disinfection purposes is ***glutaraldehyde*** (e.g. Cidex). It is used in theatre, outpatient departments, dental units, ear, nose and throat units and for x-ray film processing (HSAC, 1998; HSE, 1997a). The largest quantities are used in endoscopy (medical procedure used to visualise internal organs) (Mullarkey, 1994). It is used in the cold sterilisation of surgical equipment as a 2% aqueous solution which is activated by a buffer (sodium bicarbonate) (Norback, 1988).

Thorough cleaning will remove almost all of the naturally occurring contamination. Increase in the number of operations and therefore the use of endoscopes as well as the advent of HIV infection, has increased the demand for sterilisation (Menzies, 1995). Heat sterilisation is a preferred method of sterilisation, but delicate endoscopes cannot withstand heat in excess of 60°C. Processing with ethylene oxide takes too long as a between patient routine. (Mullarkey, 1994). Yahata, Higashi et al, (1999), found that work methods for ethylene oxide were not isolated in 46% of the cases and PPE was not used in 69%.

Glutaraldehyde is selected due to its potency as a biocide with a rapid onset of action. It doesn't damage metals, plastics etc. as a hypochlorite solution might. It is effective against transmissible organisms such as *Salmonella* spp., *Mycobacterium tuberculosis*, Hepatitis B and C and HIV (Mullarkey, 1994; Fraise, 1998). Glutaraldehyde is however, toxic, irritant and allergenic. Symptoms include eczema, skin rashes, irritating dermatitis, headache, dizziness, nausea, chest tightness, metallic taste, yellow discolouration of the skin etc. especially with liquid contact with the skin (Norback, 1988). Vapour glutaraldehyde may irritate the mucous membranes of the nose, throat and respiratory tract. The effects are related to the duration and effects of the exposure (Mullarkey, 1994).

Norback 1988, found high levels of nasal symptoms, amongst employees in two Swedish hospitals, due to glutaraldehyde exposure. Many (26 - 28%) of the exposed group compared with 10 - 12% of the unexposed group developed these symptoms. Other symptoms included 'smarting of the throat' and an increase in coughing, headaches and nausea. Norback also found that some of the symptoms increased with increased exposure. Waldon, (1992), carried out a similar study of 150 employees in

two UK hospitals and found 23% had developed a skin irritation & 15% developed upper respiratory tract irritations due to occupational exposure to glutaraldehyde which can also give rise to occupational asthma (Menzies, 1995).

Glutaraldehyde can be used in automated or semi automated washer / disinfection units. Automated units reduce vapour exposure but increase the probability of spills. Employees therefore are not as careful when handling glutaraldehyde using the automated method as they think it is safer and this has also lead to an increase in glutaraldehyde spills (Niven, Cherrie & Spencer, (1997). Glutaraldehyde is now being replaced with suitable alternatives such as Perasafe.

3.2.5.2. Glutaraldehyde in Radiology

'Darkroom Disease' is a term used to describe a variety of irritant or allergic-type reactions reported by radiology workers (Genton, 1998). Contact with chemicals may occur due to the inhalation of the mixing solutions, during maintenance, when leaks occur and during the handling of waste solutions. Substances present in the processing fumes can include ammonia, acetic acid, ammonia, hydrogen sulphide, various glycols, sulphur dioxide and glutaraldehyde (Hewitt, 1993).

Glutaraldehyde, a hardening emulsion for developing x-ray solutions, can be liberated when the x-ray films are developed. Exposure to glutaraldehyde can occur through skin absorption when handling processed film. Leinster, Baum, Baxter, et al, (1993), undertook a survey of glutaraldehyde exposure in 14 locations in six health care establishments in the UK where it was discovered that employees were more concerned about the health risks associated with glutaraldehyde, than health risks associated with acetic acid and diethylene glycol which are present in the health care facility in greater amounts and are more volatile. Glutaraldehyde was also used when heat treatment could have been used as an alternative.

Due to the hazardous nature of glutaraldehyde, alternatives should be sought to replace it as a disinfectant. Nu-Cidex (stabilised buffered peracetic acid) has been promoted as a safer alternative. It is used in a variety of washer disinfectors, but is corrosive to copper and brass and can take up to 5 hours to disinfect (Menzies, 1995; Frais, 1998).

3.2.6. Chemical Accidents Hazards

Victims exposed to chemicals, whose clothing, skin or hair is contaminated due to toxic chemicals, burns etc. may put health care workers at risk of contamination. Victims should therefore be decontaminated as soon as is practicable (Olson, 1998). Burgess, 1997 found that 44% of US health care facilities, when surveyed, reported the ability to receive any chemically exposed patients

The health care establishment should be prepared for these chemical accidents, especially employees in the accident and emergency departments. An area outside of the emergency room should be prepared. Ideally, this should be out in the open, to allow for adequate ventilation and adequate disposal of the chemical (Olson, 1998). The health care establishment should have a 'Chemical Accident Plan' which should include details of treatment of unfamiliar injuries and prevention of closure of the health care establishment in the event of a serious chemical exposure. The health care establishment should also have adequate PPE available to prevent employees from becoming secondary casualties. In 1995, in a Tokyo subway, Sarin (nerve gas) was released. There were 11 fatalities and 640 casualties. Health care workers developed symptoms of dim vision, rhinorrhoea, dysnoea and chest tightness and six health care workers had to be given an antidote of Atropine (Rogers, 1998).

Chemicals can provide unsafe working conditions in health care establishments. They can lead to reproductive hazards in employees. Reproductive hazards can also be caused by waste anaesthetic gases, antineoplastic agents, solvents, visual display units (VDU's), lifting heavy patients continuously, stress, radiation exposure (prior to conception) etc. These hazards can give rise to reproductive hazards such as genetic effects, early menopause, difficulty conceiving, spontaneous abortion, ovarian failure, chromosomal abnormalities etc. (Figà-Talamanca, 1999).

3.3. BIOLOGICAL HAZARDS

Biological hazards involve occupational exposure to infectious body fluids and blood (e.g. HIV, AIDS, Hepatitis Viruses - A, B & C), allergies to latex and nosocomial (hospital acquired) diseases. Clinical employees, microbiologists, laboratory employees, mortuary technicians, ambulance personnel and pathologists face a risk of infection from biological hazards (BMA, 1994; Martin, Hudson & Strine, 1992). The

likelihood of accidental and potentially infective contact with blood and body fluids has increased over the last few years due to longer operating procedures, more complex and invasive procedures and an increase in intravascular treatments (BMA, 1994).

3.3.1. HIV, AIDS and Hepatitis Virus A, B & C

Infectious biological hazards include Human Immunodeficiency Virus (HIV), Acquired Immune Deficiency Virus (AIDS) and Hepatitis. HIV is present in body secretions, primarily in blood and semen. It is an unstable virus and is susceptible to a large number of disinfectants. HIV is not as much of a threat to Health care workers as expected (Sharbaugh, 1999) where infection is estimated to be about 1 in 300 (0.3%). A large volume of blood is required to transmit HIV, e.g. a deep penetrating injury with a hollow-bore needle (BMA, 1994). Occupational exposure to HIV is associated with increased risk of transmission due to a deep inoculation injury, the source patient being terminally ill with AIDS, visible blood in the instrument involved or an injury with a needle taken directly from an artery or vein (PHLS, 1998; CDC, 1995; Cardo, Culver & Ciesielski, (1997).

Hepatitis is the inflammation of the liver. Hepatitis B virus (HBV) and Hepatitis C virus (HCV) pose as the major occupational hazards. There is a vaccine available for HBV and is recommended for all health care workers at risk of exposure. HCV infection generally occurs due to accidental needlestick or 'sharps' injuries. HCV is transmitted by percutaneous exposure to contaminated blood or blood products. There is no vaccine available against HCV. Postexposure prophylaxis (PEP) has been ineffective in preventing HCV transmission. Hepatitis A virus (HAV) is not as common as HBV and HCV. Transmission to health care workers usually occurs when the source patient has unrecognised hepatitis and is faecally incontinent. HAV is transmitted by the faecal oral route. It does not occur after a 'sharps' injury or on contact with blood (Sharbaugh, 1999). A survey carried out by Hamid, Farooqui, Rizvi, et al, (1999), found two out of 53 health care workers were exposed to HCV from needlestick injuries. This was a 4% risk of transmission.

3.3.2. Occupational Blood and Body Fluid Exposures

Exposure to blood and body fluids can occur due to needlestick or 'sharps' injuries, splashes to the face, bites from patients and contact with laboratory specimens. In a

survey carried out in the US, 47% of respondents (n=445) had reported at least one occupational blood exposure during their career. The highest rate of exposure was observed in nurses (58%) (Asseray, Alfandari, Vandenbussche, et al, (1998). In a similar study carried out by Marcus, (1988), 63% of those exposed were nurses.

The Communicable Disease Surveillance Centre (CDSC) in London has been monitoring occupational exposure to blood borne viruses since 1984. Between April, 1998 and March 1999, 261 voluntary reports were received. The majority of these reports were from exposures to a single virus (89 to HIV, 110 to HCV and 37 to HBV) (Evans, 1999). Medical procedures associated with blood or body fluid exposures include irrigating, sawing or drilling bone, manipulating a blood vessel. Contact is most commonly associated with hip or knee replacements (Tokars, Marcus, Culver, et al, (1994). Other means of exposure include the following.

3.3.2.1. Microbore Glass Capillary Tubes

Microbore glass capillary tubes used in hematocrit determination can be hazardous to health care workers due to the transmission of blood borne pathogens. These blood filled tubes can break, especially when being inserted into sealing clay and this can lead to lacerations and exposure to blood. These capillary tubes can also break under pressure during centrifugation and can therefore pose a risk to health care workers on removal of the glass pieces and spilled blood (Jagger & Deitchman, 1998).

3.3.2.2. Laboratory Exposure

A laboratory that processes specimens from humans for any reason may unknowingly receive material from individuals infected with blood-borne viruses. These include not only clinical pathology departments, blood transfusion and forensic medicine laboratories but also others such as those involved with anthropology, *in-vitro* fertilisation, most forms of biomedical research and drug assay etc. (HSC, 1996). In 1998, a health care worker received a blood splash to the conjunctiva when disposing of an open blood tube in a laboratory. There was no contact with the mouth and there were no lesions on the skin. The health care worker immediately washed the contaminated site and contacted the occupational health department in the hospital. The health care worker then received zidovudine postexposure prophylaxis within three hours of

contamination. The healthcare worker later developed HIV and HCV due to the exposure (Ippolito, Puro, & Petrosillo, 1998).

3.3.2.3. Contaminated Medical Charts

A survey of medical charts used in a community hospital in the US, found 246 contaminated medical records. Analysis confirmed blood as the visible contaminant in 27% of the cases. Transmission of infection is highly unlikely, but infection control practices should be implemented (Fishman, Mikolich, Fort, et al, 1999).

3.3.2.4. 'Sharps' (including needlestick) Injuries

The primary activities associated with sharps injuries are disposing of needles, administering injections, drawing blood, recapping needles, handling waste and dirty lines (OSHA, 1997), movement of operator or patient during a procedure and accidents during assembly or dismantling of equipment (Lancet editorial, 1992). It is estimated that 1 in 6 contaminations from sharps injuries stems from HBV, 1 in 20 from HCV and 1 in 300 from HIV (Wilburn, 1999). In France, the risk of exposure to blood has been estimated to 0.036 incident per nurse, per month (1 needlestick injury every 28 months) (European Foundation, 1995). The time required for the operation (more than 2 hours) was also an associated risk factor in predicting glove perforations and potential contamination (Mingoli, Sapienza & Sqarzini, 1996).

In a study carried out in nine hospitals in the US, sharps injuries reports were collected over a two-year period. 3,666 percutaneous injuries were reported. 11% were suture needle injuries, and 7% were scalpel blade injuries. In this study, physicians out-numbered nurses in the frequencies of injuries as the majority of injuries occurred in the operating room (Jagger & Balon, 1995).

Phlebotomy procedures have been associated with 13-62% of injuries reported to hospital occupational health departments. A survey was carried out by the CDC to evaluate safety devices for phlebotomy in six hospitals. Respondents acknowledge reporting 302 (54%) of needlestick injuries from the previous year. Failure to report percutaneous injuries may compromise appropriate postexposure management, including postexposure prophylaxis for HIV and HBV and assessment of occupational hazards and preventive interventions (Mendelson, Soloman, Shekletshi, et al, 1997).

Sharps Injuries among Medical Students

Sharps injuries or blood splashes occur more frequently to medical students in surgery, emergency medicine and obsteterics-gynecology (Koenig & Chu, 1995). Osborn, 1999, also found that 82% of exposures to body fluids among medical students occurred in obsteterics-gynecology, surgery, medicine and emergency medicine. Suturing procedures were found to be the main reason for injuries among medical students in a study carried out by Shen, Jagger, Pearson, et al, (1999). The study also found that surgical attending physicians must be held accountable for the safety of medical students in the surgical field as a significant proportion of injuries sustained during surgical procedures was inflicted by members of the surgical team.

In a study carried out by Jeffe, Mutha & Kim, (1998), pre-clinical students were shown to know more about the efficacy of HBV and the use of antiretroviral therapy than clinical students. Pre-clinical students also reported more exposures and compliance with universal precautions (the use of appropriate personal protective equipment for anticipated contact with blood or body fluids (Akduman, Kim, Parks, et al, 1999). Training in universal precautions is therefore more beneficial during pre-clinical years before they have gained clinical experience or adopted less safe practice patterns.

A study carried out to monitor sharps injuries in the UK, found 45% of exposures to nurses were due to blood or body fluids during injection administration, whereas 80% of accidents to care assistants were due to bites (Heapy, Riordan & Fairchild, 1998). This study highlighted the fact that different emphasis needs to be placed in different areas when training groups about occupational exposures to blood and body fluids.

Prevention of Sharps Injuries

Sharps injuries may be prevented using a combination of methods, e.g. education, avoidance, communication, placement of containers (Weltman, Short, Mendelson, et al, 1995; Haiduven, De Maio, Stevens, et al, 1992), blunt needles (Mendelson, Sperling, Brodman, et al, 1997), management commitment (D'Arco & Hargreaves, 1995), quality management, new product evaluations and behaviour modification (Bryce, Ford, Chase, et al, 1999).

Prevention is important because the consequences of occupational acquired diseases are very high. These can include infection, emotional stress and changes in personal behaviour until transmission can be ruled out (Jagger & Balon, 1995). The Dublin Hospitals Risk Management Forum (1997), published a report on the 'Needlestick Subcommittee'. The aim of this committee is to concentrate on avoidance and also to manage needlestick incidents after they occur. They examine ways to reduce the number of needlestick injuries and to recommend approaches to incident avoidance.

Glove perforations can be decreased by the use blunt needles and 'double gloving' during abdominal fascia closure (Mingoli, Sapienza & Sqarzini, (1996). Blunt needles are sharp enough to penetrate internal tissues but not sharp enough to cause percutaneous injuries to health care workers (Jagger & Balon, 1995). Double gloving can decrease the feeling of sensitivity and so is only advocated for high risk patients (Shanson, Taylor, & Gill (1992). Cross, Durkan, Stokes, et al, (1998), found that blunt needles reduced glove perforations. Surgical procedures were monitored. Group A used sharp needles and when the gloves were tested, 23 perforations were found, whereas group B used blunt needles and only seven perforations were found. Only 50% of surgeons from both groups were aware that a needlestick injury had occurred. Richmond, Mc Cabe, Davies, et al, (1992), also found that 33% of the perforations found in the gloves were not noticed by the doctor when suturing.

3.3.3. Under-reporting of Occupational Exposures to Blood and Body Fluids

The International Health Care Worker Safety Centre in the US collate data on occupational percutaneous injuries and mucocutaneous exposures to blood and potentially infective biological substances. 1996 figures estimate that 39% of injuries go unreported (EPINet, 1998).

A survey carried out in Dublin Hospital in 1991, found the minority of needlestick injuries were reported (<5%). This was due to lack of time, a general perception that the task of reporting was technically too difficult and concern about confidentiality (Gaffney, Murphy & Mulcahy, 1992).

A survey of 677 doctors and midwives in two NHS Hospitals was undertaken. The survey revealed that 9% of doctors and 46% of midwives had exposure to blood or body

fluids. The doctors' main reasons for not reporting these was too time consuming and the midwives main reason was they 'did not consider anything could be done' (Burke & Madan, 1997). Shiao, Mc Laws & Huang, (1999), found the main reasons for under-reporting were: too busy to report the accident, the item was unused, unaware or reporting requirements or immune to HBV.

In a study carried out by Koenig & Chu, (1995), almost one half of all graduating medical students recalled at least one exposure, with only 40% of these reported, whereas, Kirkpatrick, Ricketts & Reeves, (1993), found that medical students only reported 16.6% of needlestick injuries. Needlestick injury rates have been shown to decrease with advancing seniority. This may be due to increasing experience and skills (Albertoni, Ippolito & Petrosillo, 1992), although surgeons are less likely to report needlestick injuries than physicians or junior doctors due to their subjective assessment of the risk (Hettiaratchy, Hassal, Watson, et al, (1998); Manian, 1996).

3.3.4. Postexposure Prophylaxis (PEP) and Seroconversion

Although preventing blood and body fluid exposures are the primary means of preventing occupationally acquired HIV infection, appropriate post-exposure management is an important element of workplace safety (CDC, 1990a). Postexposure prophylaxis (PEP) is the prevention of an illness arising after a known exposure, before the period of incubation has finished (HSA, 1998a). The decision to recommend HIV PEP must take account of the nature of the exposure, and the amount of blood or body fluid involved in the exposure (CDC, 1998). Zidovudine (ZVD) PEP is associated with a decrease of approximately 79% in the risk for HIV seroconversion (preventing the person from becoming HIV positive after exposure to the HIV virus) after percutaneous exposure to HIV infected blood (CDC, 1995).

ZDV is known to be carcinogenic in some animals and may cause toxicity in some individuals and so should only be used if absolutely necessary (CDC, 1998). Side effects associated with antiretroviral agents (e.g. ZDV) can include nausea, diarrhoea, vomiting, fatigue, headache and insomnia. These drugs may have an effect on the foetus of a pregnant woman, therefore careful consideration should be taken when deciding whether to administer PEP to pregnant employees. Considerations that influence the rationale for PEP include the pathogenesis of HIV infection, the biologic

plausibility that the infection can be prevented or improved upon by using antiretroviral drugs and the risk or benefit of PEP to exposed health care workers (CDC, 1998).

The CDC have provided an estimate of the risk of infection after substantial occupational exposure where to date, seroconversion has been recorded in 6 of 1,962 participants, who experienced 2,008 percutaneous exposures to HIV. This indicates a risk of one infection for every 320 exposures (0.31%) (Marcus, 1988). Kim, Evanoff, Parks, et al, (1999), found that only 43% of emergency department employees (n=103) knew antiviral therapy should be administered within a few hours after HIV-positive exposure.

3.3.5. Clinical waste

The composition of hospital wastes may include radioactive waste and pharmaceuticals; hazardous wastes such as cytotoxic agents used in chemotherapy, mercury and other heavy metals; waste chemicals; infectious wastes such as human blood and blood products; contaminated sharps' anatomical wastes and pathological wastes (Cheremisinoff & Shah, 1990).

Clinical waste is divided into different groups. To ensure that clinical waste does not present a risk to employees, suitable control measures must be adopted and adhered to as appropriate to each group (Figure 3.1).

Figure 3.1
Classification of Chemical Waste (Adapted form the HSAC, 1992).

Group	Description
Group A	All human tissue, including blood (whether infected or not), animal carcasses and tissue from veterinary centres, hospitals or laboratories, and all related swabs and dressings.
Group B	Discarded syringe needles, cartridges, broken glass and any other contaminated disposable sharp instruments or items.
Group C	Microbiological cultures and potentially infected waste from pathology departments (laboratory and post-mortem rooms) and other clinical or research laboratories.
Group D	Certain pharmaceutical products and chemical wastes.
Group E	Items used to dispose of urine, faeces and other bodily secretions or excretions assessed as not falling within Group A. This includes used disposable bed pans or bed pan liners, incontinence pads, stoma bags, and urine containers.

All employees, required to handle and move clinical waste should be adequately trained in safe procedures. All clinical waste should be segregated into easily recognisable colour coded containers. Careful segregation of clinical waste and non-clinical waste is essential otherwise all waste must be categorised as clinical waste (NHS Estates, 1995).

Medical waste and its disposal can give rise to occupational exposures to infectious material. The CDC, 1998 reported that less than 0.003% - 0.01% of 33,173 AIDS cases in the US involve health care workers as a result of contact with medical waste sharps.

Environmental contamination may occur between the generation of clinical waste and its ultimate disposal (BMA, 1994). Workers who routinely collect, transport, treat and dispose of untreated regulated waste, risk exposure to blood borne pathogens from direct contact with blood or other body fluids on contaminated surfaces; from spills or splashes onto cuts, abrasions, eyes and mucous membranes and from accidental puncture wounds caused by needles, scalpels etc. Housekeeping employees and porters are susceptible to occupational exposure due to the inadequate disposal of sharps (Leese, Cole & Jensen 1999).

In a study carried out by Anglim, Collmer, Loving, et al, 1995), employee health department records were reviewed for workers suffering from needlestick injuries due to needles piercing fiberboard-contaminated material containers (CMC). Of the 13 needlestick injuries resulting from needles piercing CMC's, eight occurred in housekeeping personnel. Injuries were located in the leg or torso in eight cases and on the fingers or arms in five cases.

Many problems found with clinical waste disposal are as follows:

- Clinical waste containing sharps
- Accumulation in corridors or other areas where the public have access
- Clinical waste being carried on the same vehicle as household waste
- Clinical waste being incorrectly sealed
- Clinical waste containers being overfilled
- Clinical waste containers not being labelled with their point of origin
- Clinical waste being handled too often
- Sharp boxes being overfilled and incorrectly sealed (Gifford, 1997)

3.3.6. Latex Allergies

Health care workers come into contact with latex by handling surgical equipment such as sterile and non-sterile gloves, oxygen mask straps, endotracheal tube cuffs, urinary catheters, gas masks, stethoscopes and blood pressure tubing (Safadi, Corey, Taylor, et al, 1996).

Sensitivity to natural rubber latex (NRL) was first documented by Nutter in 1979 where it gave rise to contact dermatitis. Latex hypersensitivity can lead to a 'Type I Allergy' (this can range from uticaria to asthma to anaphylactic shock) or 'Type IV Allergy' (local symptoms) (De Groot, De Jong, Duijster, et al, 1998). The powder found in NRL gloves (an ethylated corn starch) can also give rise to allergic reactions when it is combined with the protein in the glove (Packham, 1999). If this becomes airborne or is present on laboratory coats etc., sensitised persons can experience reactions even when they are not in direct contact with the substance (Adeley & Rowland, 1999).

There are five recognised routes of latex exposure - cutaneous (wearing gloves), percutaneous (when powder or moisture get under the skin through an open wound), muscosal (from urinary catheters, surgical exposure to gloves and food), parenteral (exposure by medications injected through intravenous tubing ports made from NRL) and aerosol (powder in the gloves) (Gritter, 1998). Reported reactions from the use of latex include chapping of the hands, rash on the hands, itching, hives, runny nose, sneezing, itchy or watery eyes (Johnson, 1998).

A study in Finland, carried out by Turjanmaa (1987), showed that 2.9% of 512 employees were allergic to NRL in surgical latex gloves following skin prick procedures. Employees were screened and their occupational history was recorded. Scratch-chamber tests were performed where 4.5% were suspected to be allergic to latex. Those that tested positive to this test were then prick tested. Ten out of the 15 latex allergic employees had a personal history of atopy. Only 1 of the 15 latex allergic employees had consulted a dermatologist.

Kibby & Akl, (1997), found 8.2% of employees in a large US hospital were skin test positive to latex reagents. 5.2% reported mild reactions to latex contact. Family history was found to be predictor of positive latex skin tests. De Groot, De Jong, Duijster, et al,

(1998), found 4 of 61 individuals tested positive to latex allergy when patch tested. Almost half of them tested positive for inhalant allergens when prick tested. There were 66 participants in this study, yet no one tested positive to glove powder extract. The survey also found that most individuals were not aware of the existence of latex allergy.

The National Institute for Occupational Safety and Health (NIOSH) recommend that non-latex gloves should be used procedures not involving contact with infectious materials and only to use powder-free latex (with reduced protein content) when necessary (DHSS, 1997). Alternatives to latex should be found, cotton liners or barrier creams should be used and powder free gloves should be used, especially when sensitisation occurs (Adeley & Rowland, 1999). Rego & Roley, (1999), found NRL gloves and nitrile gloves were more effective in relation to barrier performance than vinyl gloves.

The Royal College of Nursing in the UK, in 1999, launched an awareness campaign to highlight the dangers of exposure to latex - 'Getting a Grip of Latex Allergy'. The main objective of this campaign was to stop the supply and use of powdered latex gloves in hospitals, nursing homes and other health care organisations. It is estimated that more than 32 million pairs of NRL gloves are used in the NHS every year.

3.3.7. Nosocomial Infections

Nosocomial infections are infections that are acquired from the health care facility. This can affect patients as well as the employees in the health care facility. Many of these infections can be acquired in a health care facility, but can also be spread in the community and are therefore not exclusive hazards to the health care sector. Health care workers, once healthy and immunised, can resist infection. Examples of these infections include Influenza, Conjunctivitis, Pediculosis (Lice), Scabies, Meningitis, Mumps, Pertussis (Whooping cough), Rubella (German Measles), Rubeola (Red Measles) and Varicella (Chickenpox and Shingles) (Bertin, 1999; Sharbaugh, 1999; Matlow, Nelson, Wray, et al, 1997; Weber & Rutula et al, 1994; Steingart, Thomas, Dykewicz, et al, 1999).

The following are hazardous nosocomial infections (more common in the health care facility than in the wider community) that can be acquired by health care workers in the health care facility.

Cytomegalovirus (CMV)

Cytomegalovirus (CMV) occurs directly through either intimate contact with the excreter of the virus or through contact with secretions especially saliva or urine. CMV can also be excreted by a children and is also present in immuno-compromised patients. Health care workers caring for patients with CMV are primarily at risk if they are immuno-compromised or pregnant (Sharbaugh, 1999; Rogers, 1997).

Herpes Simplex Virus (HSV)

There are two types of virus, Type 1 (HSV-1) and Type 2 (HSV-2). HSV-2 is generally associated with sexual transmission, whereas HSV-1 is associated with non-genital sites (e.g. mouth, eyes and skin above the waist). Transmission can occur through contact with herpetic lesions or with other virus-containing body fluids. Infection on the hands of health care workers from patients shedding HSV can result in 'Herpetic Whitlow' (Sharbaugh, 1999).

Prions

Prions, previously described as 'slow viruses' have become an important health issue following the outbreak of Bovine Spongiform Encephalopathy (BSE). Similar agents are responsible for Creutzfeld-jakob Disease (CJD). These agents can contaminate surgical instruments and are resistant to standard methods of disinfection. Employees in neuropathology departments have developed the disease, but the risk is considered low (Miller, 1988).

Tuberculosis (TB)

The term tuberculosis refers to a clinically apparent active disease caused by *Mycobacterium tuberculosis*. It is carried in airborne particles (droplet nuclei) that can be generated when persons with pulmonary of laryngeal TB sneeze, cough, speak or sing. Infection then occurs when a susceptible person inhales the droplet nuclei containing *Mycobacterium tuberculosis* and bacilli become established in the alveoli of the lungs. The probability that a susceptible person will become infected depends upon

the concentration of the droplet nuclei in the air, contact between susceptible persons and an infectious patient in confined spaces inadequate ventilation which results in insufficient dilution or removal of infectious droplet nuclei, and re-circulation of contaminated air (Dooley, Castro, Hutton, et al, 1990).

Multi-drug resistant TB organisms can lead to higher occupational exposures through atypical clinical presentation, but fewer than one third of close contacts with infected patients become infected (Markowitz, 1994). The resurgence of TB and the high incidence of TB in HIV persons offer the potential for an increase in TB among those who work in microbiology laboratories and necropsy rooms, while the emergence of multi-drug resistant strains render the consequences of such disease more serious. Risk of infection can be due to inhalation of bacilli in aerosols or dried material, by injuries such as cuts and accidental inoculations with infected instruments and skin lesions through cuts and abrasions. Particular hazards include containers contaminated on the outside and unfixed sputum smears. Specimens such as urine and pus may contain bacilli but the sender may not know this. Blood from HIV persons should also be regarded as a potential source of infection. Cutting into tissues after death, especially the lungs, can be hazardous also. (Collins & Grange, 1999).

Health care workers assigned to TB wards are more likely to have tuberculin skin test conversions than health care workers assigned to other wards. The rate of clinical TB in health care workers caring for HIV-infected patients with TB is significantly higher 0.86 cases/year per 100 HCW) than the rate of health care workers caring for HIV-negative TB cases (0.3 cases/year per 100 HCW) (Di Perri, Cazzadori, Conia, et al, 1992). Mortuary technicians and employees on infectious disease or respiratory wards are likely to be a particular risk from TB (BMA, 1994). In a study carried out by Pearson, Jereb, & Frieden, (1992), skin tests varied by location: 0% in an outpatients clinic, 7% in an operating room, 22% among respiratory therapy employees, 27% on a general medical ward and 50% on the HIV ward. Health care workers should be alert to the need for preventing TB transmission in settings in which persons with HIV infection are cared for, especially settings in which cough-induced procedures are being performed (CDC, 1990b).

3.3.8. Food Poisoning

Patients suffering from debilitating diseases should receive safe and nutritious food as part of their treatment programme during their stay in hospital (Mc Glone, Dickerson, Davies, et al, 1995). Pathogenic bacteria, when ingested in large qualities, can cause food poisoning. Food poisoning can be dangerous, especially to those with impaired immune systems – young, old, pregnant women or immuno-compromised individuals.

Cook-chill systems are used when a large volume of people need to be catered for at the same time. It is viewed as a cleaner (to avoid food poisoning outbreaks) and more economical method of meal production. This system involves more procedures than traditional cooking, therefore the systems must be as safe as possible to ensure that the food is fit to consume, especially for patients with impaired immune systems (Food Safety Advisory Committee, 1991). A cook-chill system is operated in many health care facilities. This involves cooking the food to a temperature of 74°C, cooling the food (using a blast chiller or allowing the food to cool to between 0 and 3°C at room temperature for no longer than 90 minutes) and storing the food under chilled conditions until the food is ready to be reheated (regenerated) to 70°C. The food is then distributed on the wards.

HACCP (Hazard Analysis Critical Control Points) is a food safety management system required by the EC (Hygiene of Foodstuffs) Regulations, 1998. HACCP is an analytical tool which enables management to introduce and maintain a cost-effective ongoing food safety programme. It involves the systematic assessment of all the many steps involved in processing of the product and identification of those steps which are critical to the safety of the product.

Despite having safe systems in place, outbreaks of food poisoning can occur in health care facilities which can be harmful to patients, employees and visitors. An outbreak of food poisoning occurred at the Stanley Royd Hospital in 1984 where over half of the patients were affected and 19 deaths occurred. This was due to mismanagement in the hospital (DHSS, 1986).

Over one fifth of patients and employees (n=460) became ill due to an outbreak of gastrointestinal infection that followed a buffet style party on a ward in the UK in 1996.

Some of the food was prepared by the hospital, other food was prepared by friends and relatives of the patients. The outbreak spread to seven of the eight wards in the health care facility (Fone, Lane & Salmon, 1999). Williams & Brand Miller, (1992), also found many health care facility cook-chill food services did not operate within the cook-chill guidelines.

3.4. HUMAN FACTOR HAZARDS

Human factors play an important role in safety and health. Organisational factors, job factors and personal factors influence human behaviour. Organisations should therefore promote a positive safety and health culture, the task should be structured around the employees. Personal factors such as strengths and weaknesses in relation to certain job requirements should also be included (HSE, 1997b).

Assault, stress and substance abuse are the main human factors of concern in the health care sector. The European Foundation Report, (1995), stated that 39% had experienced assaults from patients at some point in their career, with 5% reporting assaults from visitors. 16% reported severe injuries as a result, while verbal abuse accounted for between 8% and 10 % of assaults.

3.4.1. Stress

Individuals under stress perform less than optimally and that stress has an adverse effect on productivity, quality and ultimate safety (Glendon, 1995). Many factors have contributed to the high levels of stress experienced by Irish nurses. Financial constraints can result in increasing the ratio of patients to nurses, increasing patient turnover due to shorter hospital stays, cutting resources, nursing shortages and introducing student and part-time staff (O' Regan, 1999).

A study carried out by the Irish Nurses Organisation (INO) in 1993, found that stress was a problem among Irish nurses where 771 completed questionnaires showed causes of stress were over-work (56%), lack of consultation and communication (46%), being undervalued (44%), insufficient resources (31%) and factors not under their direct control (30%). Inadequate employee levels was the single most important cause of stress amongst the sample. There were also relatively high levels of stress (25%) associated with having to deal with blood and body fluids. Student nurses experienced

more stress than all other grades of nursing. Lack of management support was strongly related to a range of stress related outcomes. Stress can then result in burnout, psychological distress, low job satisfaction and intentions to quit (Wynn, 1993).

A study carried out to examine occupational stress in four areas of nursing (theatre, liver/renal, haematology/oncology and elective surgery) found that the amount of stress was similar across all four departments, however, theatre nurses experienced less stress through patients' death (Tyler, 1994). A study carried out by Wheeler, (1994), examined stress levels between in a general hospital and a maternity hospital. There was no significant difference between general nurses and midwives in their overall stress level. The four factors giving rise to stress emerged as work overload and time pressure, organisational and management issues, poor relationships and poor working conditions and facilities. Position and grade was seen as having a significant effect on stress. Staff nurses reported more stress than sisters where workload (amongst staff nurses) was found to be more stressful than organisational issues (amongst ward sisters).

Newly qualified staff nurses in the UK experience stress due to their lack of confidence in their ability to be competent in practice and feelings of inadequacy because of their inability to deliver holistic care, work overload, a deficit in practical and management skills, gap between educational priorities and reality of clinical practice and lack of qualified support in clinical practice (Charnley, 1999).

In a study carried out by Williams, (1997), senior house officers (SHO's) had significant levels of distress which was associated with low levels of confidence. Factors identified as causing stress during consultations were identified as difficulties with communication, certain clinical presentations and departmental organisational factors (especially the intensity of the workload). Ramirez, Graham, Richards, et al, (1996), found that stress associated with burnout and psychiatric morbidity was due to feeling overloaded, its effect on home life, feeling poorly managed and resourced and dealing with patients' suffering.

Plant, (1992), found that consumption of alcohol and concern about AIDS were predictive variables of stress which support the conclusion that stress is associated with job characteristics.

3.4.2. Shift Work / Long Working Hours

Shift work can be defined as regularly taken employment outside the day working window, defined arbitrarily as the hours between 0700 hours and 1800 hours. When the human circadian rhythm (period of 24 hours) suffers an abrupt change in schedule it can lead to malaise, irritability and gastro-intestinal distress that is caused by a loss of harmony in the various component processes that make up the overall circadian rhythm. This can result in social changes, stress and strain, health consequences and performance and safety consequences for the shift worker (Monk, 1992).

There are many factors affecting shift work which can influence the level and nature of health and safety performance outcomes. These include the attitudes and motivation of the people concerned, the job requirements and other aspects of the organisation and cultural climate (Spurgeon, 1997). NCHD's (Non-consultant Hospital Doctors), i.e. Irish junior doctors, are estimated to work approximately 100 to 120 hours per week. At the beginning of May, 2000, the NCHD's prepared for a one day strike in protest of the failure to deal with long working hours, outdated over-time rates which contribute to long working hours and poor professional training. The HSA has set up an expert committee to examine complaints made by junior doctors. These issues cover adverse affects on the health, safety and welfare of the junior doctors as a result of the long working hours.

A survey carried out by the British Medical Association (BMA) showed that a quarter of respondents regretted embarking on a career in medicine due to the long hours worked (Beecham, 1995). Consequences can then include loneliness, depressive reactions, disrupted marriages, drug abuse, cognitive impairment and suicidal thoughts (The Working Conditions for Hospitals in the European Union, 1995).

Waldron, 1996, estimated that 87% of doctors in the UK reported that they had worked when they had felt unwell. The majority of respondents to this questionnaire were

general practitioners (50.9%) and hospital doctors (38.2%). 82% stated that they had prescribed treatment for themselves at some point in time.

Macias, Hafner, Brillman, et al, (1996), found that shift work and long hours can have an effect on employee performance and accident rates. Analysis of 411 blood and body fluid exposures demonstrated that more employees were exposed between 0900 hours and 1100 hours. Significant numbers of exposures occurred during the first hour of the shift and at the shift's end.

Permanent night shift nurses were found to use a higher rate of hypnotics or tranquillisers than other shift workers in a study carried out by Niedhammer, 1995. Niedhammer also found that the older the employee, the more likely they were to take the drugs.

3.4.3. Violent Abuse and Assault

As many as 523,000 workers in the England and Wales were physically assaulted by members of the public during the course of their work in 1997. The workers most at risk were identified as police, social workers, probation officers, publicans or bar staff, security guards, nurses, general practitioners, retail workers and transport workers (Health & Safety Review, 1999).

Violence covers a wide range of incidents, not all of which involve injury. Violence can be defined as:

"Any incident in which a person working in the healthcare sector is verbally abused, threatened or assaulted by a patient or member of the public in circumstances relating to his or her employment" (HSAC, 1997).

The HSA produced a guidance note entitled "Violence at Work in the Health Services Sector" 1998, where it highlighted susceptible employees as being both general and psychiatric nurses, ambulance employees and younger and inexperienced employees, however, no employees were highlighted as being entirely exempt. The problematic areas within the health care facility were highlighted as being A&E, psychiatric, mental handicap and elderly care units, ambulance work and lonely and deserted area in the health care facility (HSA, 1998b). Violent situations generally arise due to the patients mental condition, head injuries, patients or relatives of patients waiting in long queues,

alcohol or reaction to bad news, receiving care from health care workers (physical contact) (Bergstörm, 1994).

In a study carried out by the INO in 1993, 39% (n=771) of nurses reported experiencing assault from patients at some time in their career. Of those who experienced assault, 66% reported minor or moderate distress and 12% experienced severe distress. Patients and their relatives were the most frequent source of verbal assault. Between 8% and 10% of nurses reported frequent verbal abuse from fellow employees (Wynne, 1993).

Whittington, (1996), carried out a survey in a large hospital in the UK. All occupational groups had been exposed to verbal abuse and all groups reported physical assault apart from midwives. Rates of violence were highest among A&E employees. A survey of accidents and emergency nurses (n=196) was undertaken by Schnieden, (1995), to study the prevalence, types and possible precipitating factors of violence in the workplace. The study highlighted physical violence and verbal violence as issues. 1 in 3 nurses were affected by physical violence and whereas verbal violence was much more common with 87% of nurses affected by it. Night or unsociable hours led to an increase in both verbal and physical violence.

Brewer, (1999), found that there were many factors which could contribute to violence in health care facilities. Monitoring of violent incidents can be difficult due to differing individual experiences or perceived attitudes towards violence.

Grenade, (1995), surveyed two teaching hospitals in the UK, where a comparison of physical assaults on student nurses and other grades of nursing employees was undertaken. A questionnaire was distributed to a psychiatric hospital and a general hospital. The results found indicated that the level of assaults was higher in the psychiatric hospital, but the severity of the assault was greater in the general hospital. Over the fifteen month period, it was found that the rate of physical assault was higher among student nurses than among other grades of nursing employees. Grainger, (1993), found that student nurses comprised of 19% of the workforce, yet sustained 24% of the assault injuries.

A document was produced by the NHS in Scotland, the 'Action Plan 28 – Accidents in the NHS in Scotland', found that 74% of assaults to NHS trust personnel were due to physical violence, 12% were due to vandalism, 7% were due to verbal abuse and / or threatening behaviour and 7% were due to theft (Blair, 1997).

Occupational violence in aged care is a recognised occupational health and safety problem. Employees believe that resident violence is 'just part of the job' and are therefore reluctant to report incidents. Violence is not seen as an issue because it can be unintentional. Assault can range from verbal abuse to physical abuse (biting, pinching, scratching, spitting and punching) (Newhouse, 1997). Toomingas, (1994), found that from 2,483 reports of intentional violent accidents in Sweden from 1990 - 1991, 766 (31%) were made by health care workers and the total number of sick leave days amounted to 18,000.

Jenkins, (1998), found that the chief causes of verbal abuse and physical violence in Irish and UK A&E departments were due to alcohol, waiting times, recreational drug abuse and patients expectations. Nurses were found to be the main recipients of abuse. Patients who were offensive to nurses, were less aggressive when the doctor arrived. Inner city hospitals received higher level complaints also.

Nurses are also expected to be caring, professional, supportive and able to cope at all times by putting the needs of the patients' first (Wynne,1993). Farrington, (1997), found that nursing personnel assaulted by patients, wanted to hit back in anger rather than just defend themselves but were restricted from doing so because of their professional identity.

Ambulance personnel are also subjected to assaults. In 1996, the West County Ambulance NHS Trust in the UK was served with an improvement notice because it had failed to take practical steps to reduce risks from violence when one employee was assaulted twice within a twelve month period (Le Poidevin, 1999). Harkness, (1997), conducted a study of violence among taxi drivers and health care workers and found that only 17% of health care workers had received some form of violence training.

The NHS have launched a resource pack entitled 'Managers' Guide - Stopping Violence Against Staff Working in the NHS: We don't have to take this', 1999. This NHS zero tolerance campaign is a nation wide campaign to tackle violence against employees working in the NHS.

3.4.3.1. Horizontal Violence

'Horizontal violence' is a particular kind of workplace violence, defined as conduct or actions by a colleague indicating overt or covert hostility towards an individual worker. Racial slurs, physical threats, intimidation, unlawful touching and sexual harassment are examples of horizontal violence (Edwards, 1999).

Farrell, (1997), found that nurses were more concerned about their colleagues aggression towards them than that of aggressive patients. Colleague abuse ranged from non-verbal innuendo to physical assault. Respondents were also concerned with the lack concern and action taken by their nurse managers.

Condell, (1998), surveyed the incidence of bullying among Irish nurses. Bullying included verbal and physical abuse and left nurses concerned, anxious and with a loss of confidence. Certain factors were identified which lead to bullying. These included stress, bullying from doctors and nurse management, the female predominance in the profession, repression of nurses individuality and nursings' historical link with religious conservatism.

In a study carried out by Quine, (1999), employees who were bullied were found to have significantly lower levels of job satisfaction, higher levels of job induced stress, suffered from depression and intended to leave their jobs. The most common bully was found to be the senior manager or line manager (54%) and in 34% of cases the bully was someone on the same level of seniority as the victim. Raknes, (1994), found that nurse peer groups and senior nurses were the most frequent bullies where bullying varied from slander, silence and hostile attitude from the aggressor, withholding information and scolding by colleagues and supervisors.

Sexual harassment is also a problem amongst the nursing profession. Sexual harassment by definition is unwelcome, unreciprocated behaviour of a sexual nature

which is offensive to the person involved and can cause that person to feel threatened, humiliated or embarrassed. Sexual harassment is pervasive, insidious and often devastating in its effect and student nurses are seen as being particularly vulnerable. Sexual harassment may take the form of verbal abuse, unnecessary touching, insensitive jokes, questions about personal life, leering or physical contact (INO, 1998).

3.5. FIRE HAZARDS

A fire in a health care facility would pose a threat to the lives of everyone within it but particularly to its patients. Therefore hospitals and other health care premises require a fire safety strategy based primarily on avoidance of fire. In its event, there must a means for rapid detection, containment and control, supported by reliable and rehearsed procedures for removing patients to places of safety. 'Firecode: Policy and Principles', a UK publication, provides the framework for such a fire strategy. Firecode is a suite of documents which includes Health Technical Memoranda (HTM) and Fire Prevention Notes (FPN).

Fire Prevention Notes highlight the importance of fire within health care facilities. FPN - 9 (NHS Fire statistics 1994/1995) highlighted the importance of arson prevention and waste management in health care facilities. In 1994/1995, 903 fires were reported to the NHS in England. These fires resulted in 111 injuries and one death. The main causes of fire found were deliberate ignition (33%), smokers' materials (20%) and equipment failure (19%). Most of the fires were discovered by employees (60%), smoke detectors (26%) and patients (7%). Other FPN's include the following:

- FPN 1: Laundries, 1987
- FPN 2: Storage of Flammable Liquids, 1987
- FPN 3: Escape Bed Lifts, 1987
- FPN 4: Hospital Main Kitchens, 1994
- FPN 5: Commercial Enterprises on Hospital Premises, 1992
- FPN 6: Arson Prevention and Control in NHS Health Care Premises, 1994
- FPN 7: Fire Precautions in Patient Hotels, 1995
- FPN 8: Atria on Hospital Premises, 1995
- FPN 9: NHS Fire Statistics 1994 / 1995

Health Technical Memoranda offer guidance of fire safety in healthcare facilities:

- HTM 81: Fire Precautions in new Hospitals, 1993
- HTM 82: Alarm and Detection Systems, 1989
- HTM 83: Fire Safety in Health Care Premises: General Fire Precautions, 1994
- HTM 85: Fire Precautions in Existing Hospitals, 1994
- HTM 86: Fire Risk Assessment in Hospitals, 1994
- HTM 87: Textiles and Furniture, 1993
- HTM 88: Fire Safety in Health Care Premises: Guide to Fire Precautions in NHS Housing in the Community for Mentally Handicapped (mentally ill) People, 1986.

People's behaviour in fire depends on the roles that they perceive to be relevant to their responsibilities in the organisation. Shoppers and hotel guests expect to be guided by employees on what to do and that employees accepted that responsibility (Building Research Establishment (BRE), 1993). This is particularly true where patients are highly dependable on health care workers e.g. the elderly, mentally ill, those in intensive care, theatres etc. The lack of alertness, mobility and high dependency on fixed equipment of these patients have implications for their safety in the event of a fire (Charters, 1996).

3.5.1. Horizontal Evacuation

A major difference between occupancies in office buildings and residential buildings is that occupancies in office buildings are usually not responsible for others (Proulx, 1997). Evacuations in health care facilities must take the form of a phased evacuation which will lead to total evacuation of the whole building:

- **Immediate evacuation** - Remove patients or visitors from immediate source of fire.
- **Horizontal evacuation** - 'Progressive Horizontal Evacuation' overcomes the problem of evacuating intensive care patients, coronary care patients, patients in post-operative recovery rooms, babies in premature baby wards, patients in operating theatres, non-ambulant patients and patients attached to life support machines (Kelly, 1998). Horizontal evacuation moves patients away from the scene of the fire, continuously, until vertical evacuation is considered and requires active fire protection systems, correct building design and sufficiently trained and drilled members of staff to work effectively (Orr, 1994)).
- **Vertical evacuation** - Exits by protected staircases to a lower level.
- **Total evacuation** - Assembly points located outside of the building.

A fire which originates in an occupied room is the most common fatal fire. The function of that room most often relates to sleep or patient care and less frequently to sitting, recreation, circulation or utility (Williams, 1986). Generally, each compartment should be enclosed by 'one hours' fire resistance. Within each one hour compartment, there may also be two other types of compartmentation; sub-compartments and fire hazard rooms. Sub-compartments can divide the ward department into two or three 'protected' areas enclosed by half hour fire resistant construction. This is intended to allow employees in the department of fire origin to move patients from the sub-compartment of fire origin to adjacent sub-compartments or compartments as the first stage of progressive horizontal evacuation. Fire hazard rooms are intended to separate those parts of departments or wards containing significant fire load and / or ignition sources (e.g. kitchens day rooms etc.) from the bedded areas (Connolly, 1997).

One of the most crucial elements of success of the observation of fires by people in general and employees in particular, is the layout of the ward. Patient beds should be positioned such that as high a proportion as possible (consistent with clinical care and privacy) are visible from the nurses station (Charters, 1997).

Fire alarms sound frequently. Averages over a wide range of building occupancies in the UK suggest that the ratio of false to genuine alarms can be as high as 15 to 1. Many of these false alarms are due to burning toast on the wards (Palmer, 1988).

Catchpole, (1995), describes an evacuation drill that was carried out in the Intensive care unit in a UK hospital in 1994. The purpose of the study was to ascertain employee reactions, to ensure that corrective action was taken, monitor how employees interacted with the local fire brigade and to monitor how long the evacuation actually took. The intensive care unit was on the sixth floor of the building in which there was a unit of seriously ill patients with one-to-one nursing in place. The ITU department had been closed for refurbishment and was due to open the following day. The alarm was activated when a staff nurse saw smoke coming from a store room. Employees were evacuated to a nearby ward on the same floor. Nurses had to reassure parents and patients that were agitated by the thickening smoke. The situation was becoming more dangerous so it was decided that employees must be evacuated, and fire officers would evacuate the last few patients. The results showed that one nurse returned and had to be

rescued by the fire brigade; the ringing of the fire alarm made communication difficult and too many patients were evacuated. Many patients were on ventilators and so did not have to be evacuated unless the fire brigade thought it necessary (Catchpole, 1995).

3.6. CONCLUSION

This is a non-exhaustive account of intrinsic hazards associated with the health care sector. Many of the issues cannot be dealt with by the individual health care facilities, for example – NCHD's working approximately 100 to 120 hours per week. This is putting the NCHD's under considerable stress and possibly endangering the life of a patient. Shortages in nursing personnel nationwide has created problems with low levels of NPR's and with nurses having to work longer hours also. These issues should be rectified at a governmental level. Other issues, for example – sharps injuries, elevated glutaraldehyde levels and bullying from colleagues should be dealt with by the management in the individual health care facilities.

CHAPTER FOUR
METHODOLOGY

4. INTRODUCTION

This chapter outlines the materials and methods used throughout this study in order to achieve the objectives identified in the introduction of this thesis. Before the following approaches, deemed appropriate for the exploratory research undertaken, are discussed, the limitations encountered during this study, are discussed below.

4.1. LIMITATIONS

Due to the growth of the 'Celtic Tiger' and the current economic boom in Ireland, shortages in staff and high staff turnover (especially the nursing profession) have caused problems for many organisations. This is reflected in the health care facility involved in this study.

- Distribution of survey A to catering employees was found to be a limiting factor. This department was under-staffed and those employees present were continuously covering sick leave, as well as doing their own work. It was difficult to gather more than 10 employees together at one time. Surveys were distributed when management of the catering department could release staff for the completion of the survey, and only then in smaller groups of four or five. As a result, completion of the survey by all catering employees took longer than anticipated.

- A dispute arose amongst the Irish nursing profession which resulted in industrial action on October 19th, 1999. This industrial dispute limited the distribution of survey B. The survey had been piloted previously and the necessary amendments had been made. The survey was ready for distribution when the industrial action began. The survey was not distributed immediately after the industrial action ended, as there may have been some bias involved. The distribution of the survey was then put on hold for approximately one month as a result of this.

- Access was not permitted to all areas of the health care facility. The reason for this was attributed to staff shortages and busy schedules. Access to individual wards depended on the good will of the nursing manager or ward sister in charge, therefore not all wards were included in the study.

- Duplicates of the accident and incident report forms were not all forwarded to the author. Some of the forms, duplicated on a monthly basis, may not have been submitted immediately to the department (where the forms are submitted) in the health care facility. When the author's monthly figures were compared with the health care facility's monthly figures, some discrepancies were found. The reason for this was that the author had not received all duplicates of the forms (approximately 50 forms). Searching for the non-duplicated forms proved difficult due to the omission of names and addresses. It took approximately two days to locate and duplicate the missing forms.

4.2. PROJECT METHODOLOGY

The aim of this study was to develop and evaluate an integrated risk assessment technique as a tool for evaluating existing risk management systems within a health care setting.

The research used for the purpose of this project is 'conclusive research'. Conclusive research is based on representative samples and the data obtained is subjected to quantitative analysis. The findings of this study are considered to be conclusive in nature, in that they are used as an input into managerial decision-making. Conclusive research designs can be either descriptive or causal and descriptive research designs may be either cross-sectional or longitudinal. (Malhotra, 1999).

For the purpose of this study, descriptive research designs were chosen. Descriptive research is a form of conclusive research that has, as its major objective, the description of something, usually market characteristics or functions. The cross-sectional study is the most used descriptive design in marketing research. Multiple cross-sectional designs involve two or more samples of respondents and information from each sample is obtained only once (Malhotra, 1999).

The methodological approach adopted by the researcher is a positivistic (quantitative) approach as opposed to a phenomenological (qualitative) approach. This involves the collection and analysis of numerical data and application of statistical tests (Hussey, 1997).

The project methodology took the following form. Three risk assessment techniques were chosen to formulate the risk assessment tool. It is better to utilise a number of risk assessment methods in order to ensure that the identification process is complete (Garavan, 1997). These risk assessment techniques were as follows:

- Workplace Survey (inspection)
- Analysis of accident and incident report forms
- Psychometric analysis

These three risk assessment techniques were chosen from a set of risk assessment techniques (see section 1.4) for the following reasons:

- The workplace survey is the most common risk assessment method used.
- Access was permitted to the accident and incident report forms. These were consistently kept and are amenable to statistical analysis. Access to backdated forms was also possible.
- The human factor element of safety management is now taking centre stage (Madders, 1998). A positive safety culture is a prerequisite for safety management. Culture can be difficult to measure, but best responds to the psychometric paradigm. This risk assessment technique can provide further information that the other two risk assessment techniques cannot offer.

4.3. HEALTH CARE FACILITY - A BACKGROUND

For the purpose of this study, a large general hospital in the Dublin area was contacted and a confidential contract was agreed upon. It was agreed that all the data and information collected would be treated in the strictest of confidence and sensitive data would not be disclosed. Duplicates of the accident and incident report forms were forwarded to the author on a monthly basis for the purpose of statistical analysis. The forms remained confidential, as the names and addresses of the employees or third-party personnel (in-patients, out-patients and visitors) were not duplicated.

This health care facility employs over 2000 employees, has approximately 600 beds and provides specialist treatments such as surgery, intensive and coronary care, accident & emergency; age related health care etc. Access, for the purpose of the study, was permitted to all areas of the health care facility.

4.4. PRIMARY / SECONDARY RESEARCH

There are two sources of research data. Original data, known as 'primary data', is data collected at source, for example – survey data. 'Secondary data' is data that already exists, such as books, documents, and films. For example, the literature search is primarily secondary data (Hussey & Hussey, 1997).

4.4.1. Secondary Research

4.4.1.1. Literature Research

The aim of the literature search is to identify as many items of secondary data as possible, which are relevant to the research topic. The purpose of exploring the existing literature is to ascertain what has been written or published in this area of research, how previous research was conducted and how this will impact on the author's research (Hussey& Hussey, 1997).

Current literature on safety legislation, risk management, safety management and integrated risk management was reviewed to familiarise the author with general safety management principals for chapter one. Chapter two consisted of a comprehensive literature review on risk management within the health care sector, including a review of health care sector hazards. The reviewed literature was sourced from academic journals, trade magazines, textbooks and conference papers from conferences attended in Ireland, the UK and Canada.

4.4.2. Primary Research

Primary research is divided into three sections, each representing each of the three risk assessment techniques chosen. The first section concerns the workplace survey carried out in the catering department. The second section concerns risk assessment involving the analysis of accident and incident report forms and the third section concerns risk assessment utilising a psychometric technique.

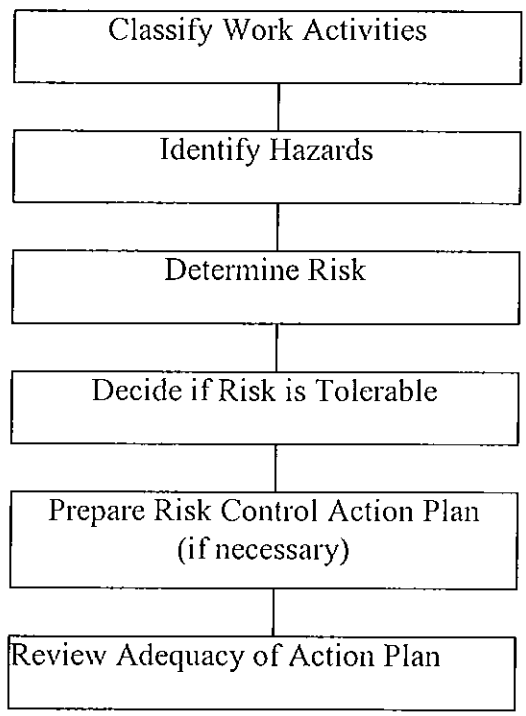
4.4.2.1. Risk Assessment Technique - Workplace Survey (Inspection)

A survey was conducted in the catering department in the health care facility. The workplace survey assessed all hazards in the catering department, including food hygiene hazards, safety hazards and fire hazards.

This risk assessment approach adopted was based on the BS 8800 (Figure 4.1) risk assessment approach. This system involves three basic steps:

(a) Identify the hazards
(b) Estimate the risk from each hazard – the likelihood and severity of harm
(c) Decide if the risk is tolerable (BS 8800, 1996).

Figure 4.1
The Process of Risk Assessment (Adapted from BS 8800, 1996)



All hazards in the department were noted. The appropriate level of risk was then assigned to each hazard before the final decision on the control measure or appropriate action required was made.

4.4.2.2. Risk Assessment Technique – Accident/Incident Report Forms

A commonly used distinction between accidents and incidents is that accidents have a specific outcome, for example injuries or damage, while incidents have no outcome of this type, but could have had in slightly different circumstances (Ridley & Channing, 1999).

Accidents and incidents are defined as follows:

*"**Accident** - any undesired circumstances which gives rise to ill health or injury; damage to property, plant products or the environment; production losses or increased liabilities"*
(HSE, 1997c).

*"**Incident** - all undesired circumstances and 'near misses' which could cause accidents"*
(HSE, 1997c).

There is a relationship between the severity of the outcome and the frequency of the outcome. As the seriousness of the outcome increases, the frequency of that outcome decreases. There are therefore more minor injuries than fatalities. There are also more 'near misses' than minor injuries or cases of minor ill health. This relationship forms the 'accident triangle' (Figure 4.2). Much can therefore be learned from investigating individual minor incidents and near misses as can be learned from investigating individual major injuries (Ridley & Channing, 1999).

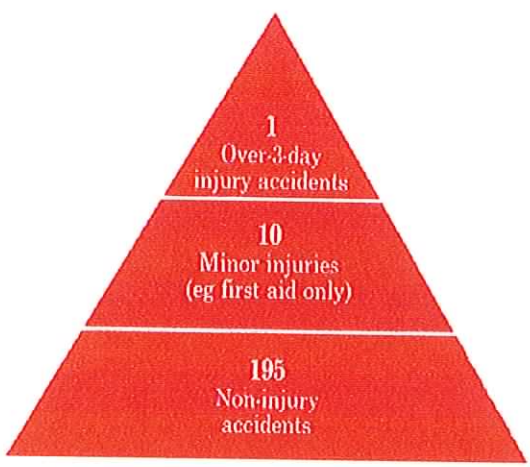


Figure 4.2

The Accident Triangle (Adapted from HSE, 1997d).

Accident / Incident Report Forms – Health Care Facility

Accident reporting and procedures and investigative strategies should be examined for their objectivity and ability to detect valid causes (DeJoy, 1994).

Duplicates of the accident and incident report forms were forwarded to the author on a monthly basis for the purpose of statistical analysis. 1,365 accident and incident report forms were received from June, 1998 to November, 1999 inclusive. These were accidents and incidents that were reported to the health care facility.

The design of the form will influence the outcome of what is reported (Ridley & Channing, 1999). At the beginning of the 18-month period, two forms were being used to collect accident and incident data. One form was for staff and the other form was for patients or visitors. Aspects of these two forms were then combined and a new form was produced for staff, patients and visitors (Appendix A). The new form contained the following details:

Date of Incident,
Time of incident,
Date of birth / Age,
Public / Private patient,
Grade of position,
Location of incident,
Cause of Incident,
Affected parts of the body,
Witnesses,
Date incident reported,
To whom reported,
Gender,
Employee position,
Third-party category,
Type of Incident,
Details of Incident,
Medical Findings,
Name & Address of person involved

Accident and incident data can be used to implement and improve control measures and can allow for:

- Measuring whether performance is improving or deteriorating using trend analysis.
- Making comparisons using accident and incident data.
- Learning from accident and incident occurrence by using epidemiological analysis (Ridley & Channing, 1999).

It is insufficient to judge the success of the safety management systems by counting the number of major accidents; some more pro-active performance indicators are needed. Key performance indicators or indicators of good safety culture should be used (Mitchison & Papadakis, 1999).

4.4.2.3. Risk Assessment Technique - Psychometric Analysis

An example of a performance indicator is a survey. The survey, a positivistic methodology, is based on the questioning of respondents to obtain certain information. Respondents are asked a variety of questions regarding their behaviour, intentions, attitudes, awareness, motivations and demographic and lifestyle characteristics (Hussey & Hussey, 1997; Malhotra, 1999).

In order to create a holistic integrated approach to managing risks in the health care sector, individual management system components, i.e. safety & health, fire safety, environmental management, food safety, occupational safety and health, quality etc. must be assessed and evaluated. In order for successful (risk management) integration to take place, employee's opinions (or perceptions) about a new culture should be measured (Rahimi, 1995). Attitude can be measured using communication techniques (self-reports, responses to unstructured or partially structured stimuli, performance of objective tasks), observation techniques (overt behaviour, physiological reactions) and self-reporting techniques (the use of scales i.e. nominal scales and rating scales) (Kinnear & Taylor, 1996). Two health and safety attitude and climate surveys were therefore developed based on psychometric analysis.

Psychometric Analysis

Psychometric tests are constructed tasks, administered under controlled conditions in order to measure individual traits. Psychometric tests involve factor analysis techniques, which are designed to identify the main traits that account for the differences in performance between people carrying out a range of different tasks. Psychometric tests can be used as a measurement tool to predict work attitudes and behaviour (Williams & Taylor, 1993). A psychometric risk assessment tool can enable comparisons and act as a common denominator for comparing different groups (Zohar, 1980).

A Psychometric Risk Assessment Tool, was conducted using a study carried by the Aerospace Psychology Research Group (APRG) in Trinity College Dublin, entitled 'Aircraft Dispatch and Maintenance Survey' (ADAMS). The ADAMS project took an integrated approach to the management of safety and reliability in the aircraft maintenance sector (Mc Donald, 1999).

Health and Safety Attitude and Climate

The ADAMS safety attitude and climate scale was modified for the purpose of the author's study to form the basis of the psychometric risk assessment tool. The ADAM's scale was originally developed by generating a large number of items derived from both the literature on safety attitudes and climate and experience from the industry. The safety attitude items used a 5-point scale, while the safety climate used a 2-point scale to

force the respondents to make a decision. This study was further developed by the author to measure behaviour and knowledge in addition to attitude and climate. The psychometric risk assessment tool was also modified to assess food hygiene, fire safety and occupational safety and health in addition to safety and health. Several discussions took place in consultation with members of the Aerospace Psychology Research Group in the Department of Psychology, Trinity College Dublin, regarding the design of the two risk management surveys.

Safety Attitudes relate to opinions about the importance of safety procedures and behaviour. Organisational safety climate concerns the perception of company policies towards safety, safety communication, feedback on performance and conflicting demands concerning safety (Mc Donald, Cromie & Ward, 1997).

A study was carried out by Cheyne, Cox, Oliver, et al, (1998), to examine the architecture of relationships between components of organisational safety climate, including employee attitudes to safety issues and perceptions of the work environment. The study found a common structure, or architecture, of attitudes to safety issues and perceptions of the work environment could be constructed that explained levels of safety activity.

The psychometric risk assessment tool was developed to form two risk management surveys. Each of the surveys measures knowledge, behaviour, attitude and climate. The two risk management surveys were both divided into three **sections**. The first survey entitled *"Food Hygiene Risk Management Survey"* (Survey A) was divided into the following sections:

(a) Food Hygiene
(b) Safety and Health
(c) Fire Safety

This survey (Appendix B) was distributed to employees in the catering department in the health care facility. The second survey, entitled *"Occupational Safety and Health Risk Management Survey"* (Survey B) was divided into the following sections:

(a) Safety and Health
(b) Fire Safety
(c) Occupational Safety and Health

This survey (Appendix C) was distributed to employees working on the wards in the health care facility. Section C (Occupational safety and Health) comprises of questions formulated by the author following observed training sessions for student nurses in the health care facility. Consultation with the resident occupational health consultant in the health care facility expanded the authors understanding of the occupational injuries and problematic areas in the health care facility. This was also used as a guide for question formulation. Both surveys contain the common sections on safety and health and fire safety.

Confidentiality

Due to the sensitive nature of some of the questions, the surveys did not require the respondent to disclose their name, to ensure confidentiality. Confidentiality was also important in order to elicit a higher response of honest answers. Personal information completed included – Gender, Age, Job Description and Length of service.

Respondents were asked questions regarding their knowledge and behaviours to each of these topics. They were asked questions regarding their attitudes and perceptions of risk management issues and finally they were asked questions regarding management's position to these issues (safety climate).

Survey A contained 134 questions. Survey B contained 112 questions. The surveys were also coded at the design stage to allow for ease of analysis.

Ordinary words should be used in a survey and they should match the vocabulary level of the respondents (Malhotra, 1999). Both surveys were therefore designed allowing for reduced literacy levels, especially in the catering department.

Scale and Question Formulation

The ADAMS safety attitude and climate scale was used as the basis for scale formulation in both surveys. This scale is similar to the Likert scale. The Likert scale (a summated scale) is simply a 5-point scale in the form of: Strongly Agree, Agree, Neither Agree nor Disagree, Disagree, and Strongly Disagree. This requires respondents to indicate a degree of agreement or disagreement with each of a series of statements related to the stimulus objects (Malhotra, 1999).

Rating scales can be used for seeking opinions. The questions are close-ended questions and respondents may be provoked into giving an opinion where in fact they do not hold one. The scales used in both risk management surveys include the category 'no opinion' to avoid this. Both risk management surveys contain both open and close-ended questions. Open-ended questions are used where each respondent can give a personal response or opinion in his or her own words. Close-ended questions are used where the respondent's answer is selected from a number of predetermined alternatives. Closed questions are convenient for collecting factual data and are usually easy to analyse, since the range of potential answers is limited (Hussey & Hussey, 1997). The majority of the questions in both surveys are close-ended questions where the respondent has a choice of answers, either:

Absolutely Agree, Agree, No Opinion, Disagree, and Absolutely Disagree, or, Always, Usually, Sometimes, Rarely and Never.

These questions were worded as statements (e.g. "Management are more interested in results than safety") to which respondents indicate their degree of agreement or a disagreement. This is to avoid the response being influenced by the directionality of statements whether they are stated positively or negatively (Malhotra, 1999). It is also advisable to have an equal number of positively and negatively worded items in the scale (Moser & Kalton, 1992). Advantages of using this method, are that a number of different statements can be provided in a list which does not utilise too much space on the page and that the questionnaire is simple for the respondent to complete and simple for the researcher to code and analyse (Hussey & Hussey, 1997).

Some questions were dichotomous questions, (has only two response alternatives, e.g. yes and no). A neutral response alternative (e.g. no opinion) was not included to force the respondent to choose between 'yes' and 'no' answers, even if they feel indifferent.

Survey distribution

A sample is made up of some of the members of a population. A population may refer to a body of people or to any other collection of items under consideration for research purposes (Hussey & Hussey, 1997). The author's sampling size consisted of two separate samples from the target population (health care sector).

Pilot Studies

"Surveys do not emerge fully-fledged; they have to be created or adopted, fashioned and developed to maturity after many abortive test flights. In fact, every aspect has to be tried out beforehand to make sure it works as intended" (Oppenheim, 1992).

Both surveys were piloted. Survey A was piloted in March, 1999 among 22 full-time and part-time hotel and catering students, who work in the hotel and catering sector also. Results were analysed and amendments were made. Survey B was piloted in December, 1999 among ten employees on one ward. This particular ward was chosen by the Director of Nursing in the health care facility for the purpose of the pilot study, as it was seen to be proactive in the completion of reports and reporting of accidents. This ward was not used during distribution of the final survey. Results were also analysed and amendments were made.

Both surveys were then distributed individually to all respondents to increase the response rate due to the length of the surveys. Self-administered surveys ensure a high response rate, accurate sampling and a minimum of interviewer bias, while permitting interviewer assessments, providing necessary explanations and giving the benefit of a degree of personal contact (Oppenheim, 1992). Survey A was distributed over an eight-week period from March to May in 1999. Survey B was distributed from February to March 2000.

The chosen method for distribution is known as 'Group distribution' where respondents are gathered together at the same time. Respondents completed the survey in the presence of the author and could therefore question the author if survey questions were incomprehensible. Access for survey completion by management personnel was permitted to small groups of employees, at agreed times to complete the survey. This method is a convenient, low cost technique for administering surveys and the number of usable surveys can be high (Hussey & Hussey, 1997).

Survey A was distributed to all employees, including supervisors and managers in the catering department. The response rate for this survey was 84% (57 respondents). Survey B was distributed to employees on the wards. Access was not permitted on all wards due to staff shortages or busy schedules – e.g. the accident and emergency

department, the intensive care unit, the coronary care unit etc. Access sometimes depended on the good will of the nursing manger or ward sister in charge even when time had been allocated in advance. 76 surveys were collected from this sector. Altogether, 132 risk management surveys were completed.

4.5. DATA ANALYSIS

Statistical analysis was carried out on two of the risk assessment techniques - the accident and incident report forms and the two risk management surveys.

4.5.1. Accident and Incident Report Form Analysis

The 1,365 accident and incident report forms collected, over the 18 month period were coded and entered into SPSS (Statistical Package for the Social Sciences) version 9.0 for statistical analysis. All responses were given a code (e.g. if a respondent indicated that they were female, the response entered was 1, or 2 for male) and entered according to these coded groups. Exploratory data analysis (descriptive statistics) was carried out on the imputed information.

Exploratory data analysis is beneficial in summarising and presenting data in tables, charts, and other diagrammatic forms, which enable patterns and relationships to be discerned which are not apparent in raw data (Hussey & Hussey, 1997). Cross tabulations and non-parametric significance testing (Pearson's significance - Chi-square test) were also performed on the data. Significance testing tells us the probability of a relationship occurring in a population. Significance is measured at 0.05 (5% chance) or 0.01 (1% chance). If the significance is found to be ≤ 0.05, there is a small probability that two variables in the analysis are related. The relationship, therefore, could not have occurred by chance. The smaller the number, the higher the significance (Kinnear & Taylor, 1996).

4.5.2. Risk Management Surveys

The food hygiene risk management survey and the occupational safety and health risk management surveys were also coded and imputed into SPSS for statistical analysis. Exploratory data analysis, cross tabulations and non-parametric significance testing were performed on the imputed data. Further statistical analysis was also carried out. This included factor analysis and analysis of variance (ANOVA).

4.5.2.1. Factor Analysis

Factor analysis is widely used with the Likert scale as an exploratory device (Moser & Kalton, 1992). Factor analysis attempts to identify the underlying variables, or factors, that explain the pattern of correlation within a set of observed variables. Factor analysis is often used in data reduction to identify a small number of factors that explain most of the variance observed in a much larger number of manifest variables.

Factor analysis was carried out on the two risk management surveys. These surveys were combined as one large survey for the purpose of coding and statistical analysis (i.e. there were four distinct sections - food hygiene, safety and health, fire safety and occupational safety and health). A general factor analysis could not be carried out due to the number of different scales used throughout the surveys. Factor analysis will only work with answers of a similar scale. Factor analysis was carried out for each grouping (i.e. behaviour, attitude and climate). The knowledge grouping could not be included in the factor analysis due to the wide variety of scales used. This also applied tot he occupational safety and health section of the survey for the same reasons. Factor analysis could therefore only be performed on the three remaining groupings (food hygiene, safety and health and fire safety).

Each grouping was analysed to determine if there were any trends. It was found that the three sections grouped together under each of the three groupings (e.g. when factor analysis was carried out for all climate questions, these divided themselves into individual food hygiene, safety and health and fire safety sections). The behaviour grouping did not rotate, therefore a trend could not be established. Because the individual sections appeared under each grouping, further factor analysis was carried out for each grouping in each of the three sections. Values less than 0.5 were suppressed for clarity due to the length of the two surveys. The factors were rotated once using a varimax rotation where loadings, less than 0.3, were disregarded (see section 5.2.2.). The basic idea of rotation is to yield factors that each have some variables that correlate highly and some that correlate poorly. This avoids the problem of having factors with all variables having mid-range correlations and thus allows for easier interpretation (Kinnear & Taylor, 1996).

4.5.2.2. Analysis of Attitude and Climate Scales

All climate and attitude answers were analysed to determine an overall climate score and an overall attitude score (i.e. a figure between 1 and 5, 1 being the lowest score, 5 being the highest). Each of the climate and attitude questions was assigned a positive or negative value, depending on the phraseology of the question. The question was therefore either a positive or a negative climate question or a positive or negative attitude question.

A favourable attitude on a scale may mean a high score, then favourable items must be scored 5 for 'absolutely agree' down to 1 for 'absolutely disagree'. Unfavourable statements must be scored 1 for 'absolutely disagree' and 5 for 'absolutely agree'. If a high score means an unfavourable attitude, the opposite systems of scoring will apply. Score reversal can then be used if items are scored arbitrarily from 1 to 5 or 5 to 1 (Oppenheim, 1992).

For the purpose of this study, a high scale score demonstrates a negative attitude, therefore agreement with statements should be assigned values of 1 or 2, i.e. the scoring of these statements is reversed. These scores were then analysed under the 'compute variable'. The compute variable computes values for a variable based on numeric transformations of other variables. A value for each case (i.e. 132 cases (respondents) in total) was then determined (section 5.2.3.) When individual values for each case were computed, future statistical analysis could be performed. The mean was then calculated for an overall climate score and an overall attitude score. Individual climate and attitude scores for each section (food hygiene, safety and health and fire safety) were then determined. A comparison of means using an analysis of variance (ANOVA) was then carried out.

ANOVA is a method of testing the null hypothesis that several group means are equal in the population, by comparing the sample variance estimated from the group means to that estimated within the groups. Tukey *post hoc* - ANOVA used as method of extracting the data.

Microsoft Office Excel 2000 was used to illustrate the results found.

CHAPTER FIVE

RESULTS

CHAPTER FIVE
RESULTS

5. INTRODUCTION

The results from this study have been divided into three sections, representing each of the three risk assessment techniques employed in this study. The first section displays the results found following the risk assessment in the catering department. The second section displays the results found following analysis of 1,365 accident and incident report forms and the third section displays the results found following analysis of the two risk management surveys.

5.1. WORKPLACE SURVEY (INSPECTION) IN THE CATERING DEPARTMENT

The detailed results found from the risk assessment (survey) can be found in Appendix D. The main food hygiene hazards, fire hazards and safety and health hazards found during the survey, as described about in section 4.4.2.1. were as follows:

Hazard	Cause
Slip; trip and fall hazards	Poor floor gradient, inadequate cleaning, inadequate floor finishes and inadequate ventilation.
Impeded emergency exits	Locked fire exits, excess material stored on corridors and inadequate location of fire doors.
Contact hazards	No machinery guards on the mixers.
Contamination of Food	Inadequate cleaning, inadequate pest control prevention and unsuitable administration office locations.

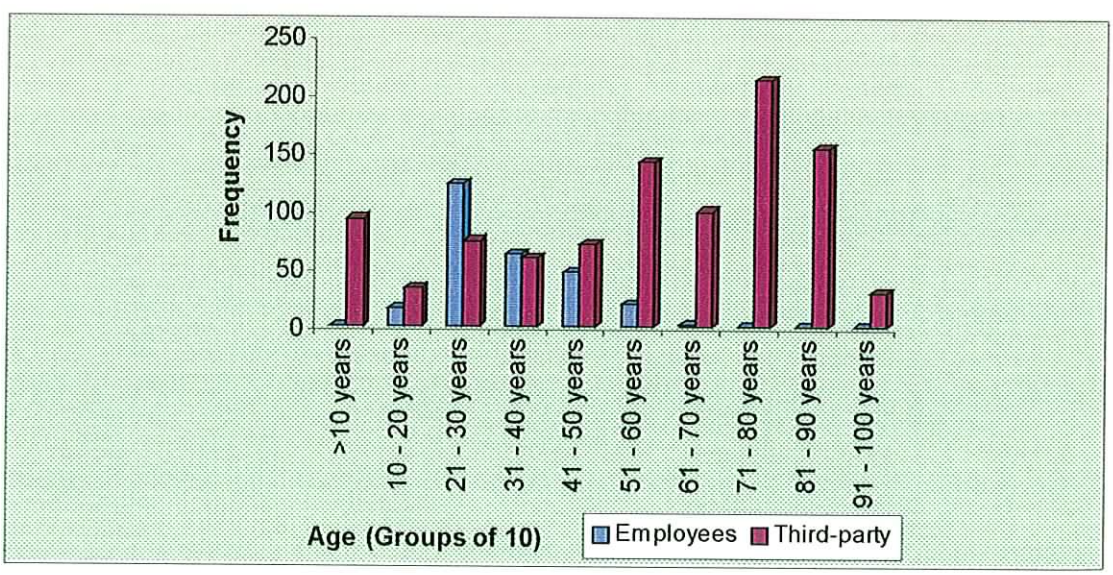
5.2. ACCIDENT AND INCIDENT REPORT FORMS

Analysis of 1,365 accident and incident report forms, collected over an 18 month period, from the health care facility (as described about in section4.4.2.2.), outlined a distinction between employee accidents and third-party (in-patients, out-patients and visitors) accidents. The 1,365 accidents comprised of 346 (25%) employee accidents and 1019 (75%) third-party accidents. Results were analysed distinguishing between the two groups and grouping them together where necessary.

Table 5.1
Demographic Information

Demographics	Categories	Frequency (n=1,365)	Percentage
Gender	Male	594	44
	Female	755	56
Age	Under 10 years	93	8
	10 – 20 years	50	4
	21 – 30 years	189	16
	31 – 40 years	123	10
	41 – 50 years	118	10
	51 – 60 years	161	13
	61 – 70 years	102	8
	71 – 80 years	213	17
	81 – 90 years	155	13
	91 – 100 years	30	2
Employees[1]	Nursing	777	38
	Clerical	380	17
	Medical	254	12
	Paramedical	251	12
	Portering staff	95	5
	Ward Attendants	84	4
	Housekeeping	73	4
	Catering	68	3
	Maintenance	32	2
	Security / Other	21	1
Third-party	In-patient	931	91
	Out-patient	54	5
	Visitor	28	3
	Other	6	1

Figure 5.1
Age of Injured Personnel – Employees and Third-party

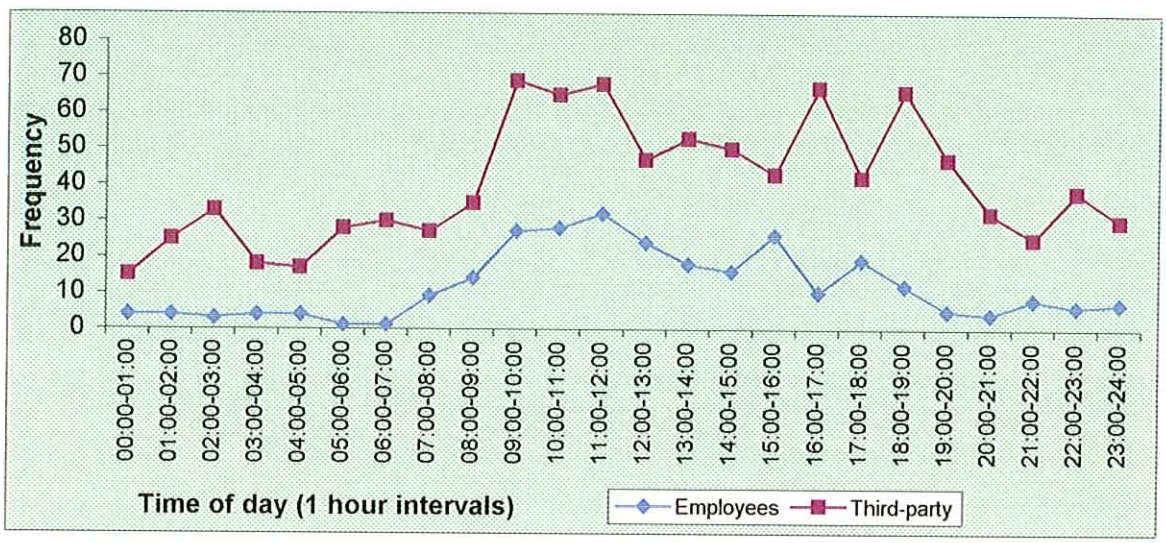


[1] Numbers of employees per category are accurate as of August, 1999

74% of employee accidents occurred between the hours of 0900 and 1900 and 62% of third-party accidents occurred at the same time. There is evidence of a statistical relationship in the pattern of employee and third-party accidents and incidents ($P<0.05$). 21% of third-party accidents occurred between the hours of 2200 and 0600 (Figure 5.2). Of this 21%, 43% were attributed to patient falls from bed.

Figure 5.2

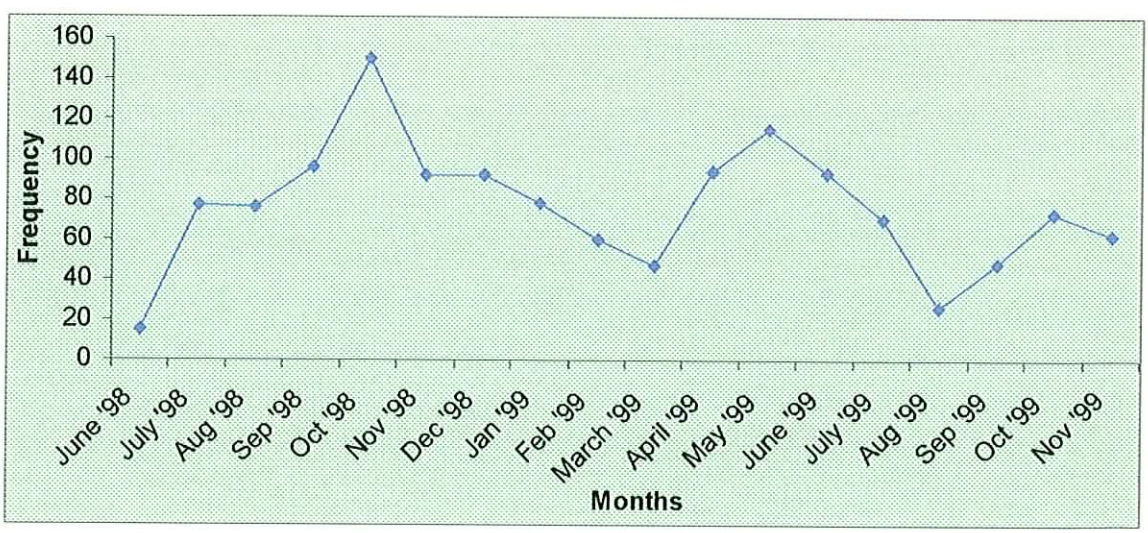
Time of Accidents and Incidents (24 hour period)



Accident and incident report forms were collected from June 1998 to November, 1999 inclusive (Figure 5.3).

Figure 5.3

Frequency of Accidents and Incidents - 18 months (June 1998 – November 1999)



5.2.1. Employee Accidents and Incidents

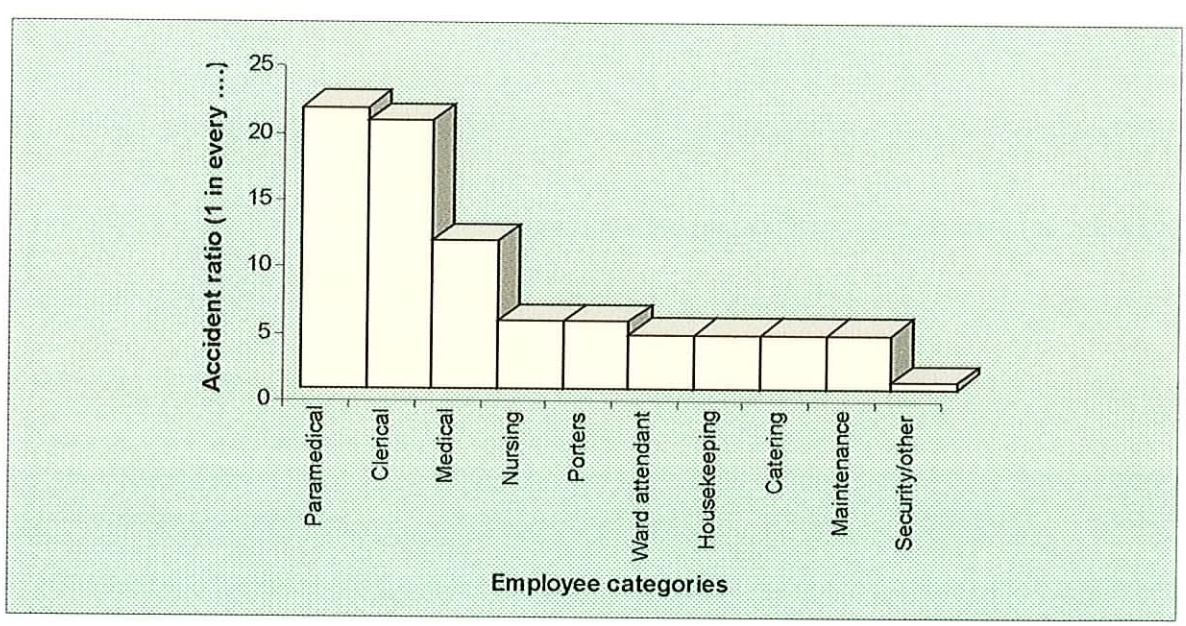
An accident frequency rate was developed by the author to determine the frequency of employee accidents. Initially, nurses appeared to have the most employee accidents, however, they were also the largest employee group in the health care facility. An employee accident frequency rate was then developed:

$$\text{Employee Accident Frequency} = \frac{\text{Total no. of employees (2035)}}{\text{Total no. of employee accidents \& incidents (346)}}$$

$$\text{e.g. Frequency of accidents among nurses} = \frac{\text{Total no. of nurses (777)}}{\text{Total no. of accidents involving nurses (158)}}$$

The third-party: employee ratio of accidents is 3:1. Figure 5.4 displays the frequency of employee accidents per employee category. One in every six employees, on average, was involved in an accident or incident during the 18 month period.

Figure 5.4
Employee Accident and Incident Ratio



Nurses account for 38% of the workforce in the health care facility, where every second employee accident during the 18 month period involved a nurse. The majority of employee accidents were attributed to needlestick or 'sharps' injuries (18%), musculoskeletal injuries (16%) and exposure to chemicals (12%) (Figure 5.5). The cause of these accidents were attributed to normal duties (28%), contact with chemicals (12%) and assault by patients (10%) (Figure 5.6).

Figure 5.5

Nature of Employee Accidents and Incidents

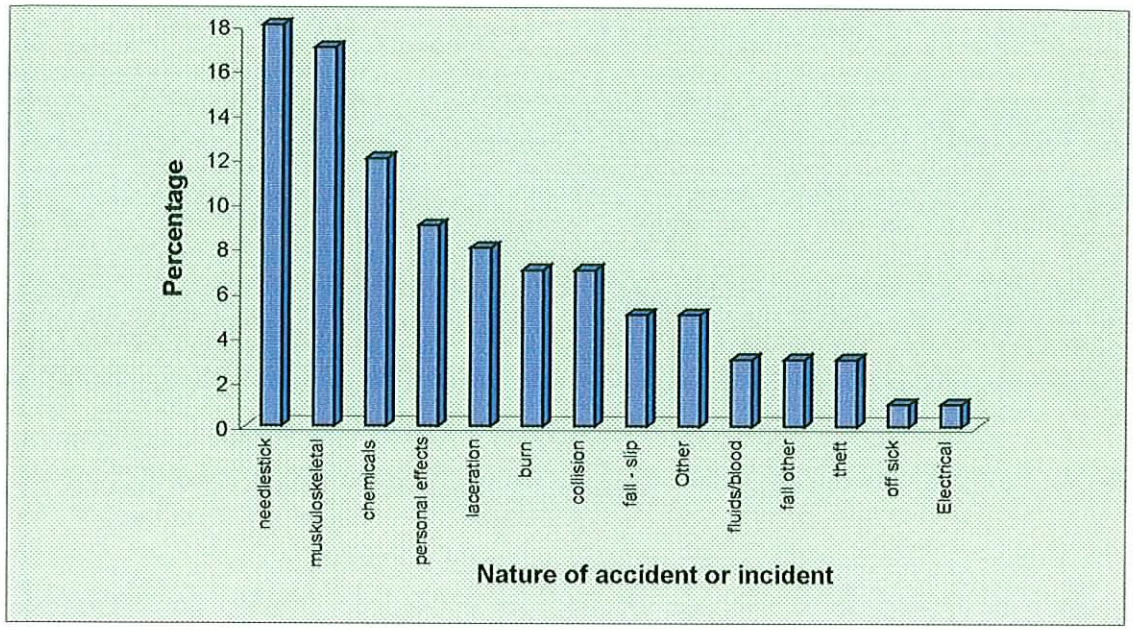
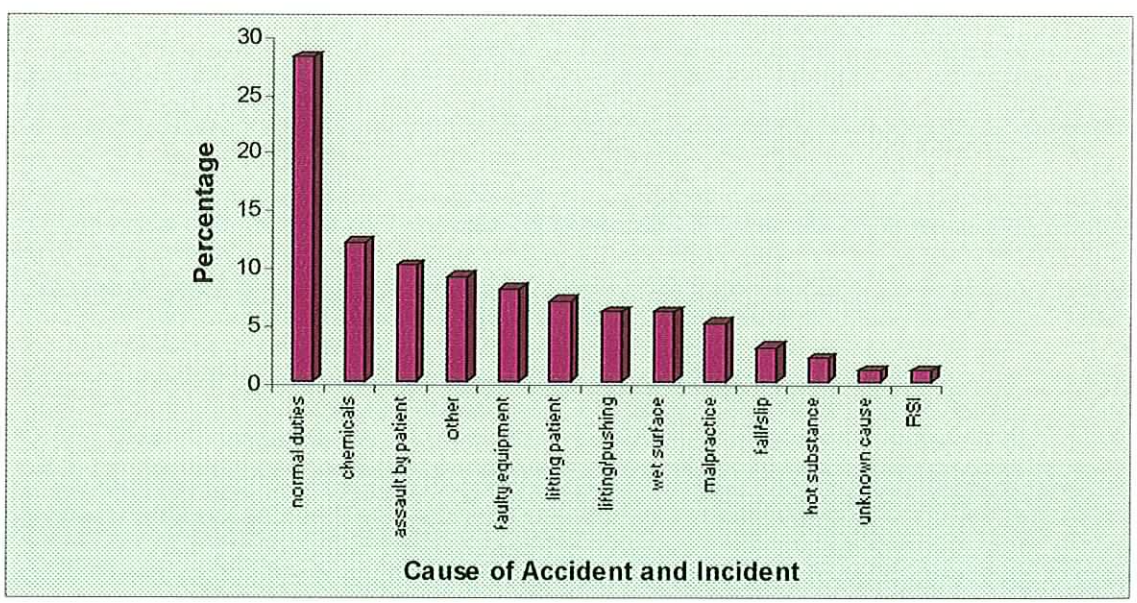


Figure 5.6

Cause of Employee Accidents and Incidents

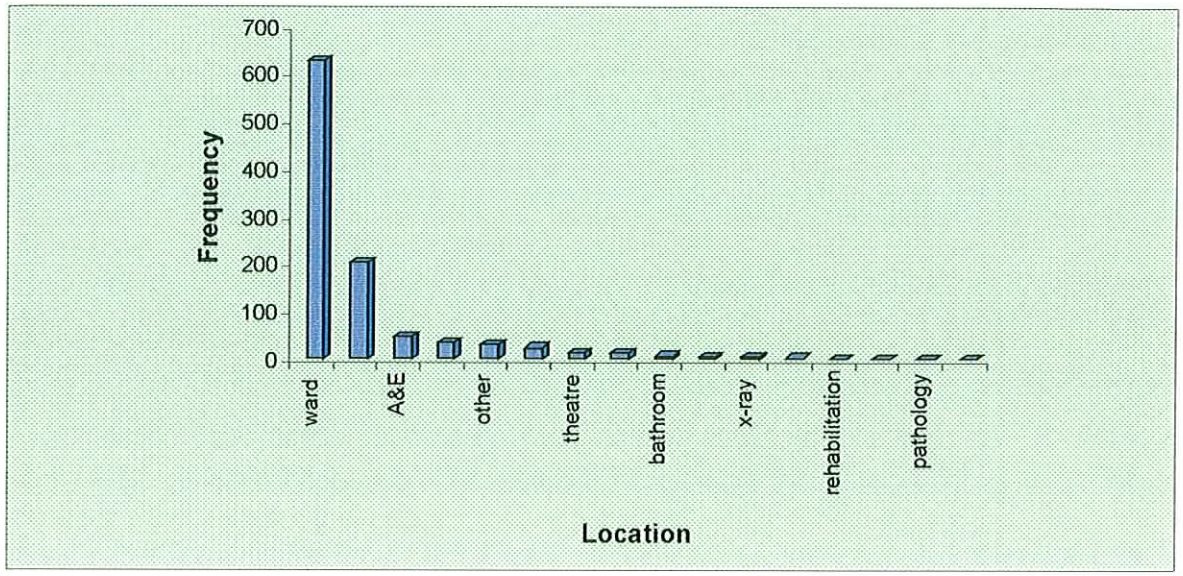


5.2.2. Third-party Accidents and Incidents

Third-party personnel include in-patients (91%), out-patients (5%) and visitors (3%). The location of third-party accidents and incidents is displayed in Figure 5.7. The majority of third-party accidents occur at ward level (63%) ($P<0.05$) and in the age-related unit (20%).

Figure 5.7

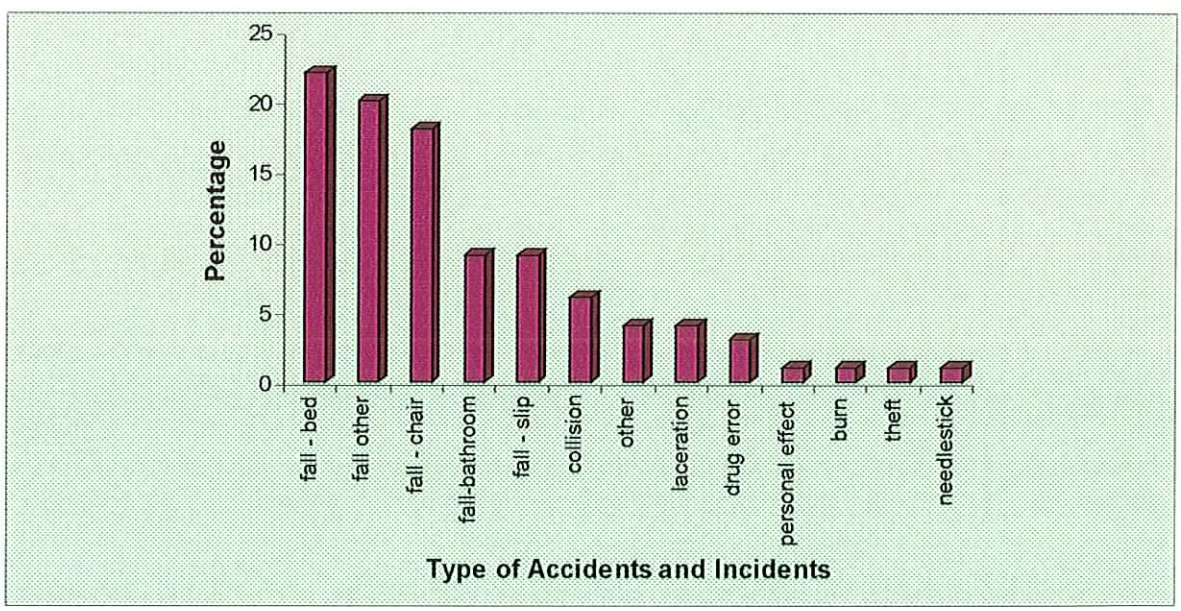
Location of Third-party Accidents and Incidents



79% of third-party accidents are attributed to falls – falls from bed (or trolley), chair (or wheelchair, commode), bathroom, slip (Figure 5.8).

Figure 5.8

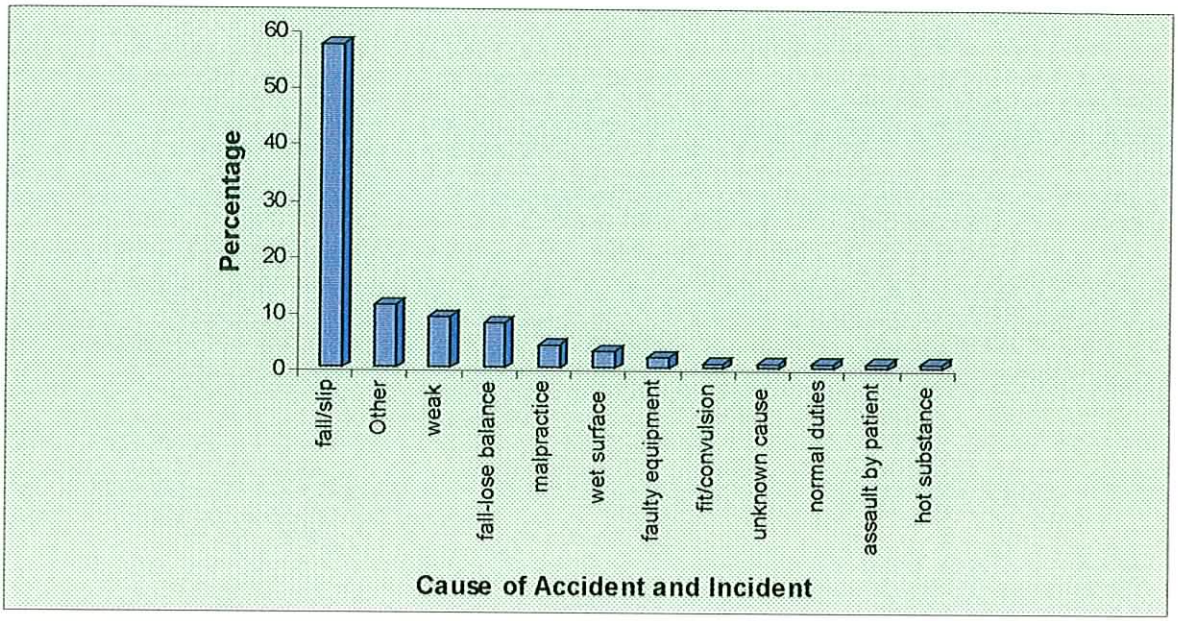
Third-party Accidents and Incidents



22% of third-party accidents were attributed to falls from bed, 20% due to 'other' falls, 18% due to falls from the chair, 9% due to falls from slipping and 9% due to falls in the bathroom. As shown in Figure 5.9, the main causes of third-party accidents were attributed to slips (57%), being weak or faint (9%) and loss of balance (8%).

Figure 5.9

Cause of Third-party Accidents and Incidents



Causes of third-party falls were also analysed and the main reasons found were slips (75%). In-patients and out-patients intake of medication was assessed to determine if it was a predictor of falls. 57% of patients were found to be on medication at the time of the fall. 69% were on medication when they fell in the bathroom, 61% when they fell from the chair and 60% when they fell from the bed. Medication was found to be a significant risk factor in predicting falls ($P<0.05$).

5.3. PSYCHOMETRIC ANALYSIS

The results found, following the distribution of the two risk management surveys, as described about in section 4.4.2.3., have been divided into descriptive statistics, factor analysis, analysis of safety attitudes and culture, and ANOVA. Due to the length of the two risk management surveys, only the most significant findings have been presented below.

5.3.1. Descriptive Statistics

Demographic information of the two risk management surveys is presented in table 5.2. There were 57 respondents to the food hygiene risk management survey (survey A) and 75 respondents to the occupational safety and health risk management survey (survey B), totalling 132 respondents to both risk management surveys.

Table 5.2
Demographic Information - Risk Management Surveys (A+B)

Demographics	Categories	Frequency (n = 132)	Percentage
Gender	Female	116	87
	Male	17	13
Age	Under 20	29	22
	21 – 30 years	60	46
	31 – 40 years	26	20
	41 – 50 years	14	11
	51 – 60 years	2	2
Employees	Chef	13	9
	Catering Assistant	32	24
	Porter/potwash	4	3
	Management	7	5
	Portering staff	95	5
	Nurse	34	26
	Student nurse[2]	31	24
	Sister	7	5
	Other	4	3
Length of Service	< 6 months	32	25
	6 mths - 1 yr	10	8
	1 - 2 yrs	14	11
	2 - 5 years	24	19
	5 - 10 yrs	21	16
	> 10 yrs	27	21

5.3.1.1. Food Hygiene Section (results from survey A only)

- 50% of catering employees were involved in the preparation of food. This included all chefs and 41% of catering assistants. 33% of employees had not received food hygiene training and 18% who prepared food had not received food hygiene training (P = 0.022). The majority of those who had not received food hygiene training had been employed for less than one year. 28% believed their training in food hygiene procedures was not enough for the work they do. 58% of those had received food hygiene training. There is statistical evidence to support the argument that those who received food hygiene training believe that the training was not adequate for the work they do (P = 0.005).
- When asked why food hygiene procedures were not adhered to, 21% of food preparation employees claimed they were under pressure from management to do other work and 19% believed food hygiene procedures caused unnecessary workload and stress.

[2] Student nurses warrant analysis as a separate from nurses due to certain issues, i.e. bullying by senior personnel, inexperience etc. (Grainger, 1993).

- 26% of food preparation employees believed that their job did not carry a high level of risk for customers (including patients).
- 93% of food preparation employees believe that food hygiene is the 'most important thing' in the catering department. This was supported by the fact that 70% believed management were strongly committed to food hygiene, 73% believed food hygiene problems were rectified quickly when brought to management's attention, 79% believed that management took the breaking of food hygiene procedures seriously and 68% believed that management would like to spend more money on improving food hygiene standards.
- Over 25% of respondents answered the temperature control questions incorrectly (Appendix B - questions 23-26). At least 20% who answered the four questions incorrectly, had received food hygiene training. 62% of chefs did not know the correct freezing temperature and 38% did not know the correct cooking temperature, yet when questioned about the responsibility of recording of temperatures in the catering department, chefs were found to record temperatures most frequently. There was a low overall response rate for these four questions on temperature control, where the maximum response rate was 54%.
- When questioned on cook-chill temperatures, only one quarter of respondents knew the correct temperatures in the cook-chill process. 25% of those who answered incorrectly, had received food hygiene training. There was a low overall response rate for these questions, where the maximum response rate was 46%. 45%, the majority of which were chefs, believed that the cook-chill process adds stress to other daily work activities.
- When questioned about colour coding to help prevent cross contamination, one-third of respondents answered all incorrectly (Appendix B - question 48), e.g. 68% of respondents did not know the correct colour for utensils associated with cooked food. 6 out of 10 chefs got this wrong, yet all had received food hygiene training.

5.3.1.2. Safety and Health Section (combined results from surveys A and B)

- 27% believe, when the job requires it; the 'most important thing' is to finish on time. Over half of these were catering assistants.
- 34%, the majority of which are nurses (including student nurses), believe that they are so used to their work that they sometimes forget the safety rules they should follow.

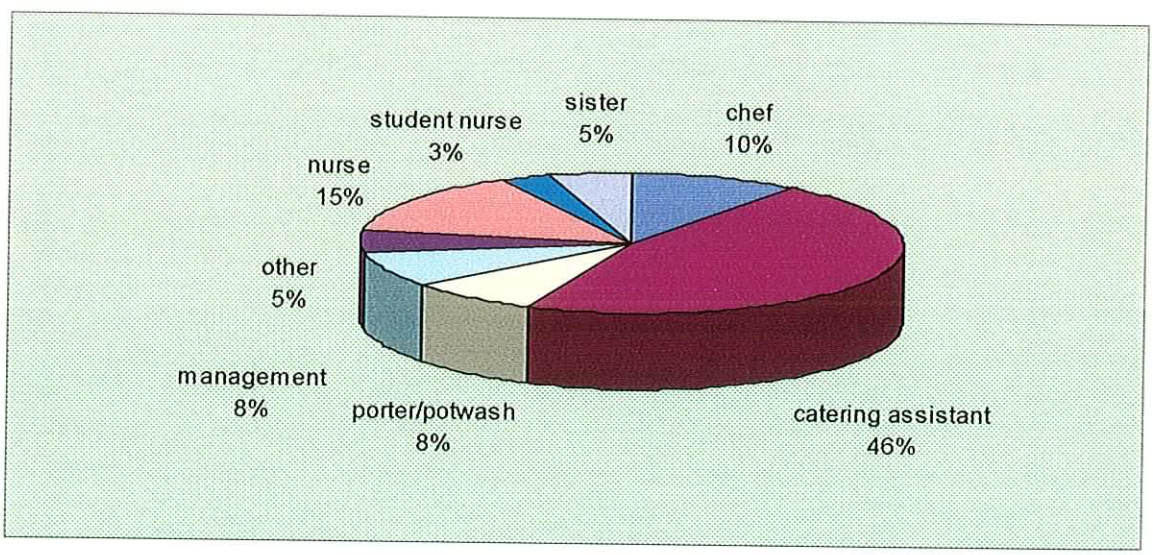
- 32% of respondents did not believe management were very committed to health and safety. This is supported by the fact that 23% believed management do not spend enough money on the prevention of accidents; 32% believed management were more interested in results than safety and 49% believed management took the breaking of rules very seriously, even when they did not result in an accident. 20% of respondents believed management were not willing to listen to new ideas in order to improve safety and in comparison to other workplaces, only 38% or respondents believed their workplace was one of the safest.

5.3.1.3. General Fire safety Section (combined results from surveys A and B)

- 31% of respondents had not received fire safety training, yet 99% believed that fire safety training was necessary. The majority of those without fire safety training were catering assistants (Figure 5.10). Over half (52%) believed the fire safety training was of a high standard. There was statistical evidence to prove that training may have increased awareness of fire safety issues where 85% of the 52% had received fire safety training ($P<0.001$).

Figure 5.10

Percentage of Respondents without Fire Safety Training



- 41% of employees in the health care facility believed they would not know what to do if the fire alarm sounded. Of the 41%, half had received fire safety training.
- When questioned on the knowledge of the location of the following items, the results found, were as follows:

Table 5.3

Respondent Knowledge of Fire Safety Issues

	Location known (%)	Location unknown (%)
Fire Exits	76	24
Call Points	57	43
Fire Extinguishers	72	28
Assembly Points	29	71

- 13% of those who received fire safety training did not know where the fire exits were located; 30% did not know where the call points were located; 17% did not know where the fire exits were located and 66% did not know the location of their assembly point.
- 67% said they would rarely or never begin evacuation procedures on hearing the fire alarm within the first 2 ½ minutes. The majority of these had not received fire safety training. 55% of those who said they would rarely or never leave were nurses and student nurses. When questioned on the length of time it would take to evacuate the premises, 39% said they would leave in the first 2½-5 minutes, but 32% said they would not leave the building at all (unacceptable).
- When questioned on non-compliance with fire safety procedures, the two main reasons given were, not knowing what the fire safety rules were (24%) and a lack of management commitment (16%). Many respondents believe that the fire safety training is not enough for the work they do (70% of those had received fire safety training).
- Only 53% believe management are committed to fire safety; 20% believe that management do not maintain good fire safety practices at work and 23% believe management do not respond to the fire alarm signal.

5.3.1.4. Hospital Fire Safety Section (combined results from surveys A and B)

- 76% of health care facility employees said that they did not know the difference between alarm sounds, yet 69% of those had received fire safety training.

There was a high percentage of 'no opinion' to the fire safety section of the survey - e.g. Q.143 (The hospital management would like to spend more money on improving fire safety practices) - 49% selected the 'no opinion' category.

5.3.1.5. Occupational Safety and Health Section (results from survey B only)

- 16% of employees at ward level said that they suffered from a work-related illness or injury and 42% of these injuries occurred during the previous 2 to 5 years. Back injuries accounted for 58% (n=7) of the injuries.
- When questioned on the reporting of accidents and incidents, 10% said they rarely or never reported all accidents and incidents. The reason for this was that they (26%) not feel that they had injured themselves enough to report it and they (19%) did not report minor injuries. 72% of employees believed that no further investigations or changes in work practices occurred following the reporting of the accident or incident.
- 14% said that they always or usually lift patients when they should be using manual handling aids (41% felt there were not enough manual handling aids in the department or ward), yet 80% said that they always or usually use the correct manual handling procedures when lifting patients. 70% admitted that they never carried out flexibility exercises.
- When questioned about strainful activities while working, the two main strainful activities found were lifting and transferring patients (23%) and being constantly on their feet (23%).
- 17% said that they had direct skin contact with drugs (e.g. antibiotics) on a daily basis. 15% said they suffered from a needlestick injury once a year or more frequently (26% said they had not received guidance on the prevention of needlestick injuries).
- When questioned on blood and body fluid exposure, 26% said they were exposed on a daily basis and 16% on a weekly basis.
- Bullying by colleagues was found to be a problem in the health care facility. 3% of respondents said that they were bullied on a daily basis, 8% on a weekly basis and 11% on a monthly basis, yet 97% or employees did not report this. The main reasons for not reporting of bullying incidents were; 63% believed no further action would be taken to improve the situation and 26% were too afraid. 91% said they had not received training on the management of violence, personal security or aggression.

5.3.2. Factor Analysis (Food hygiene, health & safety and fire safety)

Following factor analysis of the two risk management surveys, as described in section 4.5.2.1. all of the factor analysis results could not be displayed, due to the size of the two risk management surveys. Therefore only the leading factors in each of the sections are displayed below.

5.3.2.1. Food Hygiene

Climate

This analysis yielded a factor solution, which accounted for 60% of the total variance with a clear factor structure of four factors. The most common factor accounted for 23% of the variance with three smaller factors accounting for 14%, 12% and 11% respectively. The outstanding item in the first factor is management's commitment to food hygiene with regard to management taking the breaking of hygiene rules seriously and management rectifying food hygiene problems quickly. The three smaller factors related to training effectiveness and personal protective equipment, co-workers following food hygiene procedures and employees perception of risk.

Attitude

A factor solution of 80% of the total variance with a clear factor structure of 21%, 17%, 16%, 14% and 12% was found. The analysis of the first factor revealed a strong coherent food hygiene attitude factor – employees have a perceived risk of harming the customer through their food hygiene operations. This risk of harming the customer involved serving food where temperatures outside of the temperature range were recorded, putting hot food in the refrigerator, serving food where temperatures were recorded outside their respective temperature ranges and ignoring the colour coding system in place. The other factors were concerned with the date of the food products, harming the customer and inadequate training.

Behaviour

The factors could not be rotated for this section.

Knowledge

An overall factor solution of 80% was obtained with two clear factors. The leading factor, accounting for 49% of the total variance, related to general temperature control

and specific temperature control used in the cook-chill process, for example the required temperatures in the cook-chill process for the regeneration of food, the blast chiller and the plating room. The second factor, accounting for 31% of the total variance, related to general temperature control only.

5.3.2.2. Safety and Health

Climate

This analysis produced an overall factor solution of 59% with a clear configuration of four factors. The first factor accounted for 20% of the overall variance followed by three smaller factors accounting for 17% and 12% and 10% respectively. The leading item in the first factor displays the core concept of safety climate, i.e. management's commitment to health and safety. This commitment is evident via the following: management spend money on safety, when management are aware of a safety problem it is quickly remedied and management are more interested in results than safety. The other three factors are concerned with management commitment also, safety procedures and employees perception of risk.

Attitude

The analysis of the safety attitude scores yielded a factor solution of 46%, three factors accounting for 17%, 15% and 14% of the variance. The first factor relates to punishing unsafe behaviour and the perception of safety being inferior to the perception of finishing the task on time. The second factor, safety rules, is expressed by safety rules 'slowing you down', forgetting the relevant safety rules and working better without so many safety rules. The third factor concerns the perception of risk where employees find working with a certain amount of risk exciting and PPE being useful in a risky situation.

Behaviour and Knowledge

There were no behaviour or knowledge questions in this part of the two risk management surveys.

5.3.2.3. Fire Safety

Climate

This analysis yielded an overall factor solution of 59% with three factors. The largest factor accounts for 27% of the total variance followed by two smaller factors accounting

for 17% and 15%. The largest factor of 27% relates to managements commitment to fire safety. This commitment is manifested in management following fire safety rules and practices, management taking broken fire rules seriously, fire safety being important to the hospital authorities and the hospital authorities willingness to spend money to improve fire safety practices. The second factor relates to management commitment also and employees perception of the risk. The third factor relates to the high standard of fire safety and adequate training.

Attitude

The factors could not be rotated for this section.

Behaviour

A factor solution of 61% of the total variance was found with two factors accounting for 33%, 28% of the variance. Two factors relate to fire safety practices – i.e. maintaining free fire exits, not wedging doors open and evacuating within the first 2½ minutes of hearing the fire alarm.

Knowledge

There were no knowledge questions in this part of the two risk management surveys.

5.3.3. Analysis Climate and Attitude Scales

5.3.3.1. Climate Scores

The average overall score for climate the food hygiene, health and safety and fire safety sections was 3.3 (mean answer for all 132 respondents). This was almost on the midpoint of the scale (1 being the lowest score and 5 the highest). Climate scores for the individual sections were as follows:

Table 5.4

Mean Climate scores in all three sections

Food Hygiene	3.6
Safety and Health	3.2
Fire Safety	3.3

One way ANOVA was calculated to determine the difference between job descriptions, length of service and age. No significance difference was found between the length of service and the overall attitude and climate scores. One way ANOVA results indicate that safety climate varies significantly between different job descriptions (F=3.2, df=7, P=0.003). Tukey *post hoc* comparisons showed a difference between groups where nurses had a lower climate than other personnel. One-way ANOVA also highlighted a significant difference between age groups (F=2.5, df=4, P=0.044). Personnel in the 21-30 age group had the lowest climate score.

5.3.3.2. Attitude Scores

The average overall level of attitude in food hygiene and health and safety was 3.7. There was no attitude grouping for the fire safety section as the factors could not be rotated. Attitude scores for the individual sections were as follows:

Table 5.5

Mean Attitude Scores in Food Hygiene and Safety and Health Sections

Food Hygiene	3.8
Safety and Health	3.8

One way ANOVA results indicate that safety attitude varies significantly between different job descriptions (F=4.6, df=6, P=0.000). Tukey *post hoc* comparisons showed a difference between groups where porters/potwash personnel had a lower attitude than other personnel.

CHAPTER SIX

DISCUSSION

EVALUATION OF THE RISK ASSESSMENT TECHNIQUES

CHAPTER SIX
Discussion - Evaluation of the Risk Assessment Techniques

6. INTRODUCTION

The aim of this project was to develop, validate and implement a dedicated risk assessment tool which could be used to evaluate a risk management system in a health care facility. The project set out to:

- Conjoin specific risk assessment techniques
- Develop a psychometric risk assessment technique
- Evaluate the risks in the health care facility
- Apply the risk assessment tool to generate the necessary data as part of the implementation process for an integrated risk management system.

The results presented in chapter five were divided into three sections, representing each of the three risk assessment techniques used in this study. For the purpose of this chapter, the results from each of the three risk assessment techniques will be discussed individually and then a summary of the benefits of conjoining these to form the dedicated risk assessment tool will be discussed further.

6.1. RISK ASSESSMENT TECHNIQUES

6.1.1. Risk Assessment Technique One - Workplace Survey (Inspection)

The workplace inspection in the catering department evaluated food hygiene hazards, fire hazards and safety hazards found. As far as the techniques allows, the main hazards were attributed to inadequate design and layout of the premises. These inadequacies included: floor gradients, ventilation and storage facilities. Fire safety was also highlighted as problematic area. Fire emergency exits were locked and fire doors were wedged open. Excess material stored from the store rooms was stored on the adjoining corridor. This impeded the fire emergency exits and allowed combustible materials to remain in fire sensitive locations.

Contamination of food was found to be a possibility when inadequate cleaning was evident. The pest control problems were attributed to narrow pipe diameters which lead to excess waste accumulation and blockages. Debris on the floor was not cleaned immediately giving rise to slip hazards.

This risk assessment technique highlighted many hazards due to examination of the structure and observing work practices by staff. This method familiarises the risk

specialist with all areas of the premises and with all operations in those areas. The physical workplace survey was conducted using architectural drawings therefore the risk assessment technique can highlight any alterations to the drawings.

6.1.2. Risk assessment Technique Two - Accident and Incident Report Forms

This risk assessment technique included the analysis of the accident and incident report forms from the health care facility. Following the analysis of the 1,365 accident and incident report forms over an 18 month period; a distinction between employee accident and incidents and third-party accidents and incidents was found. There were three times as many third-party accidents and incidents as there were employee accidents and incidents. The through-put of third-party personnel in the health care facility must be accounted for when interpreting these results. 74% of the accidents and incidents occurred between the hours of 0900 and 1900. The increase of accidents and incidents was found to increase at the same times for both employee and third-party personnel.

The month of October, 1998 accounted for a large volume of accidents and incidents, many of which were attributed to chemical exposure. The health care facility was undergoing structural work and the adhesive used when laying the floor, caused some distress for third-party personnel, but mostly for employees.

6.1.2.1. Third-party Accidents and Incidents

66% of third-party accidents and incidents involved persons over the age of 50. This was affected by the presence of an age-related unit in the health care facility. When asked for details on the location of accidents and incidents, the word 'ward' was inserted on the accident and incident report form. This could include any ward, which may also include the age-related ward. 91% of accidents and incidents involved in-patients. Over three-quarters of third-party accidents and incidents were attributed to patient falls, and especially, patient falls from bed. Although 74% of third-party accidents and incidents occurred during the day, 21% of accidents and incidents occurred during the night (2200 to 0600 hours) and 43% were attributed to patient falls from bed. There may be two reasons for this:

- The reduced PNR may affect the monitoring of patients. Staff numbers are reduced during the night shift, but these numbers are only reduced further by the reduction in numbers of nursing personnel nationwide.
- Over half of the patients were found to be on medication at the time of the fall. This was found to be a significant risk factor. However, the term 'medication' can be used even in the case of minor therapies and the author could not prove that the medication affected the patient's behaviour. Falls may also be attributed to sleep, cotsides (where patients may attempt to climb over the side) and medical treatment. Without clinical expertise, the author cannot assess medication as a predictor of third-party falls.

These findings support a similar study carried out by Byers, Arrington & Finstyen, (1990), where patient falls at night were reported to be almost twice as high as patient falls during the day.

6.1.2.2. Employee Accidents and Incidents

1 in every 6 employees was involved in an accidents and incidents during the 18 month period. The majority of those affected were nurses, as they accounted for 38% of the workforce. Ward attendants, housekeeping personnel, catering personnel, maintenance personnel and security/other personnel had more accidents where more than 1 in 6 were involved in an accident or incident for the same period.

Paramedical, clerical and medical personnel had less accidents and incidents, where less than 1 in 6 were involved in an accident or incident. It is worth mentioning, that these accidents and incidents are the accidents and incidents that are 'reported' to the health care facility. If the accidents and incidents are not reported, an accurate picture of the frequency or nature of the hazards cannot be determined. Paramedical, clerical and medical personnel may not report the accident or incident with the same frequency as other employees. This could be due to many factors, as discussed in section 2.3.4. Medical staff may be hostile to risk management, viewing it as an easy way for hospital management to point the finger of blame at individuals and departments (Cusack, 1994).

Having consulted with the occupational health consultant with regard to the content of survey B, occupational hazards such as manual handling and dermatitis, were highlighted as being problematic areas in the health care facility. Analysis of the accidents and incidents report forms did not reflect these issues. The majority of employee accidents and incidents, most of which occurred on the wards, were attributed to needlestick injuries, manual handling and chemical exposure. The reason for the under-reporting of manual handling and dermatitis issues may be attributed to the employees' perception of the risk. Their perception of acquiring an occupational disease such as HIV or Hepatitis C from a needlestick injury, may persuade them to report the accident or incident, whereas their perception of manual handling issues may evolve from their perception of back pain as being 'part of the job' (Jones, Cockcroft, Richardson, et al, 1999). Perceived risk may be highlighted by a number of factors such as unfamiliarity, lack of control, perceived consequences and the extent to which they are viewed as catastrophic for having long lasting effects (HSE, 2000).

The under-reporting of accidents and incidents and employees perception of the risk may play an important role in the determination of trends and hazards in the health care facility. This is why accident and incident statistics should not be relied upon as the sole method for determining hazards and assessing risks in the organisation (BS 8800, 1996). In similar studies carried out by Burke & Madan, (1997); Gaffney, Murphy & Mulcahy, (1992); Koenig & Chu, (1995) results showed that not all accidents and incidents were reported to the health care facility. The international health care workers safety centre in the US estimate that 39% of injuries are not reported (EPINet, 1998).

Accident and incident report forms do however provide valuable information from different departments. Problems may be highlighted, trends monitored and if a safety intervention is employed, one method of monitoring its success is to compare accidents and incidents statistics before and after the intervention.

6.1.3. Risk assessment Technique Three - Psychometric Analysis

Each of the four sections of the combined two risk assessment surveys (food hygiene, fire safety, safety and health and occupational safety and health) will be discussed individually. The results from the factor analysis will also be discussed under each of the four sections.

6.1.3.1. *Food Hygiene Section (Survey A only)*

18% of catering employees who prepare food had received no food hygiene training. Those who had received food hygiene training, believed that it was not enough for the work they do. Many of the catering employees did not believe that their job carried a high level of risk. The belief systems of persons are widely regarded as one determinant of modifiable behaviour patterns related to hygiene (Cairncross & Kochar, 1994).
Training in food hygiene procedures is important, particularly in a health care facility where the consumers, the majority of which are patients, are immuno-compromised (Mc Glone, Dickerson, Davies, et al, 1995). Should an outbreak of food poisoning occur in a health care facility, the patients would be the group of individuals most at risk. In general, elderly people, children, pregnant women and the immuno-compromised are most at risk, but in the health care facility, the risk increases.

When respondents were asked questions regarding the failure to follow food hygiene procedures, lack of management commitment was the main reason cited, where there was pressure from management to do other work.

The lack of food hygiene training was evident in the poor response and level of incorrect answers to the temperature control and cook-chill temperature control questions in the survey. Catering employees had received food hygiene training, however, the level or method of training may not have been adequate for those involved.

Factor analysis results of climate questions revealed that management commitment was a significant issue with regard to management perceptions of food hygiene rules and the rectifying of food hygiene problems quickly. Factor analysis results of attitude questions revealed employees perception of risk as a factor. Results from the knowledge questions revealed temperature control as a factor.

6.1.3.2. *Safety and Health Section (Surveys A and B)*

Management commitment was found to be an issue in relation to safety and health. Employees, especially student nurses, appeared to be more concerned with finishing on time than in safety and health procedures. 34% admitted that they were so used to their work, that they sometimes forgot the safety rules they should follow. The training may

be inadequate, where refresher training is not provided or adequate for the purposes intended.

Factor analysis results of climate questions revealed management commitment to be the main factor. The main factor determined from attitude questions was the perception of safety being inferior to the perception of finishing the task on time and punishing unsafe behaviour.

6.1.3.3. *Fire Safety Section (Surveys A and B)*

31% of respondents, the majority of which were catering assistants, had received no fire safety training. Respondents, 52% of which had received fire safety training, believed that fire safety training was of a high standard. This suggests that training increases the awareness of fire safety issues. The training appears to be inadequate as 41% believed they did not know what to do if the fire alarm sounded. This is similar to the findings from the food hygiene section, where knowledge on food hygiene issues was poor despite training.

One finding from the fire safety section was that 71% did not know where their assembly point was located, yet 69% had received fire safety training. This supports the need for adequate fire safety training where, in the event of a fire, human behaviour can be demonstrably different to the expected (Canter, 1980).

Management commitment is an issue where over half of the respondents believe management is not committed to fire safety.

6.1.3.4. *Occupational Safety and Health (Survey B only)*

Under-reporting of accidents and incidents appears to be an issue as indicated from the risk assessment technique where accident and incident report forms were analysed. 10% of respondents said they 'rarely' or 'never' report all accidents and incidents. The reasons given were that they did not feel the injury was serious enough to warrant reporting and they did not report minor injuries. Many also believed that no further investigation of changes in work practices would occur following the reporting of the accident or incident. In a similar study carried out by Shiao, 1999, the main reasons

found for under-reporting were attributed to busy schedules and inadequate awareness of reporting requirements.

70% of nursing personnel said that they did not carry out flexibility exercises. These exercises are very important as they help to strengthen the back in order to prevent manual handling injuries (National Back Pain Association, 1992). The stressful activities encountered were lifting and transferring patients and being constantly on their feet. This is reflected in similar studies carried out by St-Vincent, Tellier, Petitjean-Roget, et al, (1999); French, Fung Wah Flora, Sum Ping, et al, (1997); Smedley, Egger, Cooper, et al, (1997); Coleman & Brooke, (1999).

Needlestick injuries are a problem. 15% of respondents said that they received a needlestick injury at least once a year. This is also reflected in the analysis of the accident and incident report forms, where needlestick injuries were the most reported occupational injury.

The psychometric risk assessment technique also highlighted the issue of bullying. Over one fifth (22%) of employees were bullied at least once a month, where 97% did not report it due to failure of investigations. Respondents (26%) were also too afraid to report the incident. The majority, 91%, had received no training in the area of personal protection (i.e. training in self-defence and the handling of aggressive personnel). Similar studies carried out by Condell, (1998) and Farrell, (1997), found doctors and nursing management were the main contributors to bullying amongst nurses.

6.1.3.5. Climate and Attitude Scores

The average climate score was 3.3 (2.5 is the midpoint). This demonstrates that there is a positive climate in the health care facility towards risk management issues assessed in the psychometric risk assessment survey. Following analysis of variance, a difference in climate was found across all job descriptions. Nurses (representing the largest occupational group) had a lower climate score of 3.0 than all other categories. Persons in the 21-30 age group category (representing the largest age group) also had the lowest climate score of 3.1.

The average attitude score was 3.7. This was a positive result. ANOVA indicated scores varied across job descriptions, where porters and potwash personnel in the catering department had the lowest attitude score of 3.4.

In general there was a high rate of 'no response' rate of approximately 46% for certain questions, especially the questions regarding temperature control. Reasons for not answering questions may be attributed to unwillingness to answer the question, not knowing the answer, or not seeing the question. There may be other reasons as to why the respondents did not answer these questions:

- Too much effort required
- The situation of context may not seem appropriate for disclosure
- No legitimate purpose or need for the information requested is apparent
- Information is sensitive.

In a similar study carried out by Williamson, 1997, peoples' perceptions and attitudes about safety as an indicator of safety culture for use with working populations, in seven different sectors, were measured. These sectors varied from heavy and light manufacturing to outdoor activities. Factor analysis was used to analyse the data. Attitude questions and questions relating to perceptions of the workplace were asked. Williamson found this method to be very informative with regard to individual attitudes and group perceptions of safety culture. The attitudinal questions revealed aspects of the respondents' beliefs which are likely to have been developed through experiences inside and outside the workplace. The climate (summary of workers' perceptions of their work environment) questions also revealed aspects of safety beliefs but which are directed towards the respondents' perceptions of reality in their workplace.

This risk assessment technique not only answered questions to the necessary risk management information required, but also facilitated significance testing which could depict trends and factors that were less obvious, examples of which were management's commitment to the individual risk management systems and inadequate training. This technique is a valuable method for eliciting reliable responses from the chosen sample and for determining trends in knowledge, behaviour, attitude and climate.

6.2. CONCLUSION

Data was generated from each of the individual risk assessment techniques. When the data from all three of the risk assessment techniques are conjoined, the information on the hazards and risks present in the health care facility is more descriptive than the results from the individual techniques and presents management with a vivid picture of the issues involved.

CHAPTER SEVEN

DISCUSSION
EVALUATION OF THE RISK ASSESSMENT TOOL

CHAPTER SEVEN
Discussion - Evaluation of the Risk Assessment Tool

7. INTRODUCTION

Each risk assessment technique highlighted hazards and risks exclusive to that technique. The workplace survey (inspection) highlighted issues such as inadequate design, substandard fire safety practices and possible contamination of food. The *analysis of accident and incident report forms,* highlighted issues such as the high rate of third-party accidents and incidents, accidents and incidents involving elderly patients, especially falls from bed and under-reporting of employee accidents and incidents. The risk assessment technique, *psychometric analysis*, highlighted management commitment and lack of training as important factors. These two factors were evident in all four sections of the two risk management surveys. Specific problems included inadequate training in food hygiene and fire safety procedures, under-reporting of employee accidents and incidents and needlestick injuries.

7.1. ADVANTAGES OF THE RISK ASSESSMENT TECHNIQUES

The advantages of each of the risk assessment techniques found are as follows:

Workplace Survey

This is the most common pro-active risk assessment technique. It:

- Elicited visual hazards in the survey area
- Familiarised the risk specialist with all areas of the premises and operations
- Facilitated contact with all employees
- Highlighted active failures in the organisation, e.g. fire doors wedged open

Analysis of Accident and Incident Report Forms

This is a reactive risk assessment technique. It:

- Allowed an evaluation of trends in all accidents and incidents
- Distinguished between employee and third-party accidents and incidents
- Sourced the locations, causes and seasonal variations of accidents and incidents
- Facilitated monitoring of intervention studies
- Highlighted active failures in the organisation
- Highlighted high risk patients - i.e. patients who may fall on a continual basis (Lambert, Wood, Kowoanko, et al, (1998); Mc Collam, (1995); Wilson 1998)).

Psychometric Risk Assessment

This is a pro-active risk assessment technique. It:

- Evaluated comparisons between departmental perceptions and sub-cultures
- Facilitated monitoring of intervention studies
- Highlighted latent failures in the organisation.
- Evaluated the effectiveness of training programmes

In certain circumstances, the psychometric technique facilitated the measurement of the elicited hazards, i.e. the number of staff who had not received training. This technique also provided qualitative evidence of behaviour, knowledge, attitude and climate towards specific hazards.

7.2. CONJOINING THE RISK ASSESSMENT TECHNIQUES

Each of the risk assessment techniques highlighted hazards exclusive to the individual risk assessment techniques. Together, however, these risk assessment techniques provided the health care facility with a more detailed qualitative and quantitative description of the hazards.

7.2.1. Benefits of conjoining the risk assessment techniques:

1. Some of the hazards found were highlighted by more than one risk assessment technique. For example, under-reporting was found to be an issue following analysis of the accident and incident report forms. Psychometric analysis found this was an issue also, but elicited further information, where the reasons found for under-reporting were:

- Employees did not feel that they had injured themselves enough to report it;
- They did not report minor injuries, and
- No further investigations or changes in work practices occurred after reporting previous accidents or incidents.

Duplication of hazards from more than one risk assessment technique, highlights the more common hazards and therefore reduces the level of subjectivity involved in risk assessment. Duplication also further confirms the existence of the hazards.

2. Risk assessments can be subjective, whether they are based upon individual attitudes, the wider beliefs within a culture, or on the modes of mathematical risk assessment, necessarily depend upon human judgement (Royal Society, 1992). If similar findings are elicited from more than one risk assessment technique, then this subjectivity in risk assessment can be reduced.

3. Results from the individual risk assessment techniques can be further evaluated when a second risk assessment technique is applied. For example, the psychometric risk assessment technique highlighted management commitment as an issue in the catering department. This was also evident from the workplace survey. The management in the catering department are responsible for maintaining clear fire emergency exits, and by impeding these exits, they are demonstrating a lack of commitment.

   Following analysis of the accident and incident report forms, bullying was not highlighted as an issue. However, following the analysis of the psychometric risk assessment technique, bullying was found to be an issue. The psychometric technique highlighted the reasons for under-reporting of bullying. These were:

   - No further action would be taken to improve the situation, and
   - Fear of reporting the incident.

4. There may be some problems associated with the individual risk assessment techniques, e.g. there are sources of error using rating scales in psychometric methods. One such drawback is that where survey scales are defined in advance by the researcher, participants are not allowed to say what really matters to them about the question under investigation, which may indicate that the psychometric approach is only painting part of the story (Royal Society, 1992). Risk perception is a dominant issue which can influence risk management decisions. Psychological approaches to risk and cognitive techniques in the psychometric tradition may reveal more qualitative characteristics of risk assessment (Frosdick, 1997). These sources of error will be reduced if more than one technique is applied.

5. The risk assessment tool can be used to assess hazard profile of the organisation with the objective of implementing a risk management system. It can then be used

in the review stage of the risk management system and finally, it can be used to audit the risk management system.

7.3. CONCLUSION

The decision to utilise these three risk assessment techniques allows for some duplication of effort by the risk specialist. This may appear to be time consuming when utilising more than one technique. However, the workplace survey, a common technique employed by many risk specialists, is one which should be routinely employed in the organisation. All organisations are required by the Safety, Health and Welfare at Work (General Application) Regulations, 1993, to report accidents over three days to the Health and safety Authority. Most organisations maintain records of all accidents and incidents. Therefore this risk assessment technique should be readily available to the risk specialist. Additional work will be required by the risk specialist when employing the psychometric risk assessment technique, one which is only suitable to that organisation. Development, distribution and analysis may be time consuming, however, it offers more information when combined with the two previous risk assessment techniques. However, the psychometric technique used here can be applied to other health care facilities and is one which can be modified for other sectors.

This synergistic risk assessment tool, a combination of the three risk assessment techniques, incorporates many active and latent failures of the organisation, as well as incorporating the human factor element of risk management. This risk assessment tool can then be used in the development and evaluation of an integrated risk management system for the organisation.

CHAPTER EIGHT

CONCLUSIONS & RECOMMENDATIONS

CHAPTER EIGHT
Conclusions and Recommendations

8.1. Conclusions
8.2. Recommendations

8.1. CONCLUSIONS

This chapter will examine the extent to which the objectives of the study, as set out in section 1.2, have been met. The chapter will draw together the main findings from the study and explore further areas of research within the realm of the changing nature of risk management.

The aim of this project was to develop, validate and implement a dedicated risk assessment tool which could be used to evaluate a risk management system in a health care facility. The methods of obtaining each of the objectives are outlined below.

Objective (1): Conjoin specific risk assessment techniques

This project set out to conjoin a number of risk assessment techniques. The three risk assessment techniques chosen were the workplace survey (inspection), analysis of accident and incident report forms and psychometric analysis. The results of these techniques were combined to provide the health care facility with a detailed qualitative and quantitative description of the hazards present. Each of the risk assessment techniques highlighted hazards exclusive to that particular technique, however, some hazards were highlighted by more than one technique. Although duplication of some of the findings occurred, the majority of the findings are exclusive to each technique. Duplication does not indicate that the techniques are eliciting similar information, but rather, some of the hazards are evident in more than one of the techniques, thereby demonstrating that the chosen risk assessment can elicit the correct information and can validate the hazards as a measure of it in some instances.

The benefit of conjoining these three risk assessment techniques is that the three separate sets of results can be conjoined. The workplace survey (inspection) focuses on structural and operational hazards. The analysis of the accident and incident report forms highlights trends and possible under-reporting. Psychometric analysis highlights the human factor hazards as well as latent failures (failures dormant in the organisation) and active failures (failures which have an immediate effect) in the organisation. Hence objective one was achieved.

Objective (2): Develop a psychometric risk assessment technique

Psychometric analysis is a measurement tool used to evaluate attitudes and behaviour (Williams, 1993). This approach enables the researcher to measure attitudes and

climate as indicated by the ADAM's project. This psychometric technique was developed by Trinity College Dublin, in the aircraft maintenance sector where safety and health attitudes and climate were measured among aircraft maintenance workers. This technique was developed further by the author to include the measurement of knowledge and behaviour as well as attitude and climate. Two risk management surveys were developed to include food hygiene, fire safety, occupational safety and health sections as well as safety and health.

This psychometric risk assessment technique highlighted issues such as inadequate management commitment and training in food hygiene and fire safety. This technique was developed as a dedicated risk assessment technique for use by the health care facility involved in this study; however, it can be modified for use in other health care facilities or other sectors. Hence objective two was achieved.

Objective (3): Evaluate the risks in the health care facility

The risk assessment tool was developed to highlight risks in the health care facility. As mentioned previously, each of the risk assessment techniques highlighted hazards that were exclusive to that risk assessment technique. The main hazards highlighted by risk assessment (workplace inspection) were inadequate design of the premises, inadequate fire safety procedures and possible food contamination. Risks highlighted, by the analysis of accident and incident report forms, were the frequency of third-party accidents and incidents, the time these accidents and incidents occurred, the type of accident and incident (e.g. patient falls), the cause of employee accidents and incidents and under-reporting of accidents and incidents. The psychometric risk assessment technique highlighted risks such as inadequate training, inadequate management commitment, under-reporting and the frequency of employee accidents and incidents. Together, however, the risk assessment techniques provided the health care facility with a more detailed qualitative and quantitative description of the hazards. Hence objective three was achieved.

Objective (4): Apply the risk assessment tool as part of the implementation process for an integrated risk management system.

In order to implement an integrated risk management system, the existing risk management systems must first be evaluated. The risk assessment tool, developed from

this study, can be used as a method of identifying and assessing the hazards and risks present in the health care facility. This risk assessment tool identified both latent and active failures in the health care facility as well as focusing on the human factor element of risk management. If an integrated risk management system, such as the Controls Assurance Project in the UK, is to be developed, the risk assessment tool will provide a detailed analysis of the findings. As some of the findings were highlighted by more than one risk assessment technique, risk ranking may be achieved, where the risks with the highest priority are assessed first as a means of implementing the integrated risk management system. Hence objective four was achieved.

This study has therefore demonstrated the following:

- This risk assessment tool acts synergistically, eliciting more information than the sum components.
- Data is generated by the risk assessment tool and is therefore valid.
- This risk assessment tool generates the required data for the implementation of an integrated risk management system.

8.2. RECOMMENDATIONS

The following, is a list of recommendations and areas for suggested further research:

1. The three chosen risk assessment techniques functioned efficiently in eliciting the required data, however, a combination of other risk assessment techniques (see section 1.5.) could be also be used.

2. An alternative risk assessment technique, interviewing employees or conducting focus groups, could offer valuable information, especially when identifying latent failures in the organisation. This could then be used in conjunction with other risk assessment techniques to generate data.

3. The psychometric risk assessment technique functioned efficiently in eliciting valuable data with regard to latent failures in the organisation. On reflection, both of these risk management surveys were too long and should be shortened for future use. In order to elicit the necessary information on knowledge,

behaviour, attitudes and climate, a further set of questions was required. Some of the more irrelevant questions could be eliminated for future work.

4. In addition to psychometric evaluation, behaviour assessment and modification can be carried out. This method can be used following psychometric evaluation. A study carried out by the Mc Vities Company in 1996, demonstrated how an employee-led safety culture was established (Madders, 1998). Mc Vities, utilised traditional performance indicators, i.e. accident figures, risk assessments and hours lost, as a method of measuring safety performance methods. However these methods were viewed only as an element of the human factor aspect of health and safety and in most cases, these were reactive measures and therefore did not involve all employees.

   Mc Vities reduced their total accidents in 1997 by 28.5% and they believed that a positive safety and health culture was developed. The Mc Vities study utilised similar risk assessment techniques as used in this study. Accident and incident report forms were analysed and safety culture was measured. This technique proved beneficial to the Mc Vities Company, as it is a proactive safety management technique.

5. Having assessed the hazards and risks present in the organisation, the next step is to assess the effectiveness of using this risk assessment tool to evaluate the risks when integrating different risk management systems in the organisation. Successful integration of risk management systems relies on demonstrable management commitment (Smith, 1998). Management should be seen to be proactively involved from the outset, in addressing all risk issues.

The risk assessment tool also allows organisations to progress in the evolving nature of risk management. Behavioural-based safety is a natural progression of safety management from the highly instituted, highly disciplined early approaches with prescriptive legislation and punishment, through the procedural / engineered systems which most progressive companies have long since established, to a system which recognises workers as mature human beings with a genuine interest in their own well-being, who contribute best when they can see that they themselves can have an

influence on their own safety. To achieve this transition is to change the culture and attitude of the work group involved (Walker, 1999).

In conclusion, good workplace health and safety management not only protects people from harm but also contributes to business and operational success. Risk assessment, required by law, should be carried out by all organisations. This study has shown that a combination of risk assessment techniques offers more detailed information for management to make an informed decision on the correct course of action. This risk assessment tool can also be used in the long-term goal of implementing an integrated risk management system in the organisation.

In the words of Peter Drucker,

> *"The first duty of business is to survive, and the guiding principle of business economics is not the maximisation of profit, it is the avoidance of loss".*
>
> (Drucker, 1990)

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APPENDICES

A - D

APPENDIX A

ACCIDENT & INCIDENT REPORT FORM

Hospital Health and Safety Input Form

Hospital Ref No:

Office Use Only | SDL Ref:

Hospital: .....

Date of incident: ..... Time: .....

Date incident reported: .....

To whom reported: .....

Name and address of person involved in incident:

.....

.....

Date of birth/age: .....

Category:

- ☐ Male
- ☐ Female
- ☐ Public
- ☐ Private
- ☐ Employee:
- ☐ Nurse
- ☐ Medical
- ☐ Paramedical
- ☐ Porter
- ☐ Domestic
- ☐ Maintenance
- ☐ Third Party:
- ☐ In-patient
- ☐ Out-patient
- ☐ Visitor
- ☐ Subcontracto
- ☐ Security

State Exact Grade: .....

Select Category which best describes event

Location of Incident

Ward name: .....

- ☐ A&E
- ☐ cafeteria
- ☐ carpark
- ☐ corridor
- ☐ grounds
- ☐ kitchen
- ☐ lift
- ☐ outpatients
- ☐ pathology
- ☐ rehab
- ☐ stairs
- ☐ theatre
- ☐ toilet
- ☐ x-ray

☐ Other: .....

Cause of Incident

- ☐ alcohol
- ☐ assault
- ☐ bath
- ☐ burn
- ☐ chemical
- ☐ faulty equipment
- ☐ fall/slip
- ☐ fit/convulsion
- ☐ faint/dizziness
- ☐ footpath
- ☐ hot substance
- ☐ lifting
- ☐ lifting patient
- ☐ malpractice
- ☐ normal duties
- ☐ wet floor
- ☐ unknown

☐ Other: .....

Type of Incident

- ☐ burn
- ☐ collision
- ☐ fall - bed
- ☐ fall - chair
- ☐ fall - level
- ☐ fall - other
- ☐ laceration
- ☐ malpractice
- ☐ sharps/needlestick
- ☐ sharps - other
- ☐ personal effects

☐ Other: .....

Details of Incident

.....

.....

.....

.....

.....

.....

.....

.....

.....

Affected Part(s) of Body

Please state relevant part of body affected:

If relevant, name of:

Nurse: .....

Consultant: .....

Witness: .....

.....

.....

.....

- State if clinical procedure was involved: yes/no
- Were the hospital regulations being adhered to by the persons involved? yes/no
- If relevant, state whether employee ceased work: yes/no
- If yes, has he/she returned to work? yes/no
- If yes, state date work resumed:

Medical Findings (if relevant)

.....

.....

.....

Why patient in hospital? .....

.....

Was patient on medication at time of incident? yes/no

If yes, please provide details: .....

.....

Conditions on site: .....

.....

Signed: .....

Department Head

Signed: .....

APPENDIX B

SURVEY A

Food Hygiene Risk Management Survey

Dublin Institute of Technology

RISK MANAGEMENT SURVEY

Instructions

This survey is being conducted by the Dublin Institute of Technology. The results are completely confidential. The survey is divided into four main areas

- Work Details
- Food Hygiene
- Fire Safety
- Safety & Health.

Each area is divided into sections. The **cook-chill** section of Food Hygiene should only be completed by those involved in the cook-chill process.

PLEASE:

- Answer all questions.
- Give your first natural answer.
- Work quickly through the survey.

WORK DETAILS:

A. **Sex:** Male ☐ Female ☐

B. **Age Group** under 20 ☐ 21-30 ☐ 31-40 ☐ 41-50 ☐ 51-60 ☐ over 60 ☐

C. **Type of Premises:** Hotel ☐ Restaurant ☐ Fast Food ☐ Bar ☐
Retail ☐ Hospital ☐ Other please specify

D. **Job Title:** Chef ☐ Catering Assistant ☐ Porter ☐
Pot/dishwash ☐ Manager ☐ Supervisor ☐
Bar Staff ☐ Cleaner ☐ Other please specify

E. **Length of service in the catering Sector:** Years _____ Months _____

SECTION A : GENERAL FOOD HYGIENE

Q1. Are you involved in the preparation of food?

Yes	No

Q2. Are you involved in the service of food or drink?

Yes	No

Q3. Have you received food hygiene training?

Yes	No

Q4. Do you break food hygiene rules at work?

Always	Usually	Sometimes	Rarely	Never

Q5. If you do not follow all hygiene rules, please indicate why not. You may tick more than one answer.

I Follow all hygiene rules at all times	
Under pressure from management to do other work	
Food hygiene is time consuming	
I don't know what the food hygiene rules are	
I see no personal benefit from following food hygiene rules	
The managers do not follow food hygiene rules	
Unnecessary stress / workload	
My actions will not cause food poisoning	
Other reasons – please specify	

Q6. Do you break food hygiene rules when working at home?

Always	Usually	Sometimes	Rarely	Never

Q7. Do you think that you have ever caused food poisoning by your actions in work?

Yes	No

Q8. If you saw co- workers using unhygienic practices would you tell them?

Always	Usually	Sometimes	Rarely	Never

Q9. While eating out (not in work or at home), would you eat the food if you knew unhygienic practices were involved?

Always	Usually	Sometimes	Rarely	Never

Q10. My co-workers follow food hygiene rules.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q11. The level of hygiene in your workplace is of a high standard?

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q12. My job carries a high level of risk for customers, staff and consumers who eat the food.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q13. My training in food hygiene is enough for the work I do.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q14. Employees with food hygiene training do their work better.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q15. A lack of food hygiene training could be harmful for the customers, staff or consumers who eat the food.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q16. Many of the hygiene problems in the catering department are due to design.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q17. The catering department is more interested in getting the work finished on time than in food hygiene.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q18. Food hygiene is the most important thing in the catering department.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q19. Management are strongly committed to food hygiene.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q20. When management becomes aware of a **food hygiene** problem in the catering department, it is put right very quickly.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q21. If food hygiene rules are broken, management take it very seriously.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q22. Management would like to spend more money on improving food hygiene standards.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

SECTION B : FOOD HYGIENE: TEMPERATURE CONTROL

Q23. What is the recommended temperature range for refrigerating food in degrees C. ?

Answer	

Q24. What is the recommended temperature range for freezing food in degrees C. ?

Answer	

Q25. What is the recommended temperature range for cooking food in degrees C. ?

Answer	

Q26. What is the recommended temperature range for keeping or holding cooked food before serving in degrees C. ?

Answer	

Q27. Do you thaw food items at room temperature?

Always	Usually	Sometimes	Rarely	Never

Q28. Do you reheat food? (Answer only if your daily activities includes cooking).

Always	Usually	Sometimes	Rarely	Never

Q29. Do you store or leave food, that has just been cooked, at room temperature?

Always	Usually	Sometimes	Rarely	Never

Q30. Do you carry out temperature checks in your workplace?

Always	Usually	Sometimes	Rarely	Never

Q31. Who checks the temperatures? (Answer only if temperatures are recorded)

Management	
Quality Control Personnel	
Chefs	
Catering Assistants	
Anyone who works in the catering department	

Q32. Do you check the temperatures of the equipment (e.g. refrigerators, freezers etc.) by reading the display dial?

Always	Usually	Sometimes	Rarely	Never

Q33. Do you use a 'probe thermometer' for carrying out temperature checks in your workplace?

Always	Usually	Sometimes	Rarely	Never

Q34. Do you dis-infect the 'probe thermometer' before using it? ? (Answer only if probe thermometers are used)

Always	Usually	Sometimes	Rarely	Never

Q35. Do you ever put hot food in refrigerators?

Always	Usually	Sometimes	Rarely	Never

Q36. Are the temperatures **recorded** in writing (or on the computer)? (Answer only if temperatures are recorded)

Always	Usually	Sometimes	Rarely	Never

Q37. When recording temperatures, do you record figures outside of the recommended temperature range? (Answer only if temperatures are recorded).

Always	Usually	Sometimes	Rarely	Never

Q38. If figures outside of the recommended temperature range were found, would you inform management / quality control personnel in your department?

Always	Usually	Sometimes	Rarely	Never

Q39. If temperatures were found outside of the recommended range would you record the "EXPECTED" reading ? (Answer only if temperatures are checked)

Always	Usually	Sometimes	Rarely	Never

Q40. Temperatures, when found outside the recommended temperature range, and served to customers, staff or consumers, could harm them?

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q41. Hot food placed immediately in the refrigerator, could harm the customers, staff or consumers who eat the food?

Always	Usually	Sometimes	Rarely	Never

Q42. If refrigerators and freezers are not kept at the correct temperature, do you think this could harm the customers, staff or consumers who eat the food?

Yes	No

Q43. Do you think it is safe to thaw food items at room temperature?

Yes	No

Q44. It is safe to reheat food?

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q45. Reheating food items could harm the customers staff or consumers who eat the food? (Answer only if your daily activities includes cooking).

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q46. Leaving food that has just been cooked at room temperature could harm the customer, staff or consumer?

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q47. Do you think it is safe to put hot food in a refrigerator ?

Yes	No

SECTION C : FOOD HYGIENE: CROSS CONTAMINATION

Q48. Please match the colour codes (for kitchen utensils) with the correct food items from the following list of colours: **Red, Yellow, White, Blue, Green**

Cooked food	
Raw food	
Fish	
Vegetables / salads	
Dairy / bakery products	

Q49. Are you provided with protective gloves in work?

Always	Usually	Sometimes	Rarely	Never

Q50. Do you wash your hands between handling raw and cooked meat, or if wearing gloves, do you change your gloves between handling raw and cooked meat?

Always	Usually	Sometimes	Rarely	Never

Q51. Do you use the same chopping board or preparation table for raw and cooked food without dis-infecting ?

Always	Usually	Sometimes	Rarely	Never

Q52. Do you use the correct colour coding system to help prevent cross contamination?

Always	Usually	Sometimes	Rarely	Never

Q53. Do you check that you are using the correct colour knife with the correct colour chopping board?

Always	Usually	Sometimes	Rarely	Never

Q54. Do you ever use the equipment sink to wash your hands?

Always	Usually	Sometimes	Rarely	Never

Q55. Do you ever use the wash hand basin to wash utensils or equipment?

Always	Usually	Sometimes	Rarely	Never

Q56. If you ignored the colour coding system, could you harm the customer staff or consumer who eats the food.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

SECTION D : FOOD HYGIENE : PERSONAL HYGIENE CONTROL

Q57. Do you wash your hands before preparing / handling food?

Always	Usually	Sometimes	Rarely	Never

Q58. How often do you wear hair covering (i.e. hat / hairnet) at work?

Always	Usually	Sometimes	Rarely	Never

Q59. How often do you wear protective clothing,(i.e. a chef's apron, uniform, overalls etc.) at work?

Always	Usually	Sometimes	Rarely	Never

Q60. Do you wear jewellery when working?

Always	Usually	Sometimes	Rarely	Never

Q61. Do you ever work when you are suffering from the flu, food poisoning, vomiting or Diarrhoea?

Always	Usually	Sometimes	Rarely	Never

Q62. Workers who wear personal protective equipment (e.g. hairnets, safety shoes etc.) are more respected by their co-workers.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q63. Wearing jewellery could cause a risk of food contamination to customers staff or consumers who eat the food.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

SECTION E : FOOD HYGIENE: STOCK ROTATION / PACKAGING

Q64. Do you check the date of the food item before using it?

Always	Usually	Sometimes	Rarely	Never

Q65. Leaving the outer wrapping on food packages during storage could harm the customers staff or consumers who eat the food ?.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q66. Food items marked 'out of date', could harm the customer staff or consumers who eat the food?

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

SECTION F : FOOD HYGIENE: CLEANING

Q67. Are you required to do any cleaning as part of your daily activities? (If the answer is no, go to the next section).

Yes	No

Q68. Do you use cleaning schedules in your workplace?

Always	Usually	Sometimes	Rarely	Never

Q69. Do you complete your part of the cleaning schedule? (Answer only if cleaning schedules are used).

Yes	No

Q70. Do you tick (sign your name etc.) to say that the cleaning has been done when it has not?

Always	Usually	Sometimes	Rarely	Never

Q71. Do you make an effort to 'clean as you go' (i.e. clean as you work)?

Always	Usually	Sometimes	Rarely	Never

Q72. Are chopping boards and food preparation tables disinfected in your workplace?

Always	Usually	Sometimes	Rarely	Never

SECTION G : FOOD HYGIENE: COOK-CHILL

This section is only to be completed by those involved in the Cook-Chill Process

Q73. What is the recommended temperature in degrees C, for ***cooking*** in the cook-chill process?

Answer	

Q74. What is the recommended temperature in degrees C, for ***regeneration cooking*** (reheating) in the cook-chill process?

Answer	

Q75. What is the recommended temperature in degrees C, a ***blast chiller*** should chill to?

Answer	

Q76. What is the maximum length of time in minutes that blast chilling should take? (Please tick one box only).

Answer	

Q77. Below what temperature in degrees C, should the temperature of the ***plating room*** be?

Answer	

Q78. The cook chill process is safer than normal cooking.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q79. The cook-chill process make my job boring

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q80. The cook-chill process adds stress to other daily work activities?

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

SECTION H : SAFETY AND HEALTH

Q81. In my opinion I can smoke at work if I am careful.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q82. I think that reporting accidents in the workplace is a way of preventing them.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q83. A good standard of safety makes my workplace more competitive.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q84. When the job requires it, the most important thing is to finish on time.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q85. Safety rules are only a way of slowing you down.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q86. I am so used to my work that sometimes I forget the safety rules I should follow.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q87. I think that safety throughout my workplace would greatly improve if unsafe behaviour was punished.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q88. Personal protective equipment is useful in a risky situation.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q89. I find working with a certain amount of risk exciting.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q90. I can do my job perfectly without so many safety rules.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q91 My employer spends enough money on the prevention of accidents in my workplace.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q92. In general, management is strongly committed to safety and health

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q93. When management becomes aware of a **safety** problem in my workplace, it is quickly put right.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q94. Management are more interested in results than safety.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q95. If safety rules are broken, management take it very seriously even when they do not result in an accident.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q96. It is just a matter of time before I am involved in an accident at work.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q97. Money spent on safety training can make an improvement to the running of my workplace.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q98. Management are willing to listen to new ideas in order to improve safety.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q99. Working safely is the most important thing in my workplace.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q100. Management always follow safety rules themselves.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q101. In comparison with other similar workplaces, I think my workplace is one of the safest.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q102. The workforce is regularly reminded about safety rules in my workplace.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q103. Management in my workplace is always informed whether work safety rules are being followed.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q104. Management would like to spend more money on improving safety levels.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q105. My job carries a high level of risk.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q106. Employees who have been given safety training, do their work better.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

SECTION I : GENERAL FIRE SAFETY

Q107. Have you received fire safety training?

Yes	No

Q108. Have you been trained in what do to if the fire alarm goes off?

Yes	No

Q109. Do you know where all the fire exits are located in the area where you normally work?

Yes	No

Q110. Do you know where the break glass units or call points(used to raise the fire alarm) are located in the area where you normally work?

Yes	No

Q111. Do you know where the fire extinguishers are located in the area where you normally work?

Yes	No

Q112. Do you know where your assembly point is located if you have to leave your building?

Yes	No

Q113. If you were instructed to evacuate your workplace or heard the fire alarm, how would you leave your building. Please tick the actions you are most likely to take .

By the entrance you would use when arriving at work	
By your nearest exit to the outside	
The way out as shown by the green running man or exit signs	
You would wait to be told or shown	
You would follow other people	
You don't normally leave the building if the alarm goes off	
Other Please Specify	

Q114. Do you begin evacuation procedures (including any pre alarm procedures) when you hear the fire 'alarm' within the first two and a half minutes?

Always	Usually	Sometimes	Rarely	Never

Q115. If you do not begin evacuation procedures within two and a half minutes of hearing the fire alarm; how long do you take

Between 2.5 and 5 minutes	
Between 5 & 10 minutes	
Between 10 and 15 minutes	
Between 15 and 20 minutes	
Between 20 and 25 minutes	
Between 25 and 30 minutes	
Over 30 minutes	
I don't normally leave the building or area	

Q116. Do you keep corridors and exits clear from furniture and equipment?

Always	Usually	Sometimes	Rarely	Never

Q117. As far as I know, my co- workers follow fire safety rules.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q118. Do you wedge / chain doors in corridors that are used a lot, to stay open?

Always	Usually	Sometimes	Rarely	Never

Q119. If you do not follow all fire safety practices, please indicate, why not. You may tick more than one answer.

I follow **ALL** fire safety practices at all times	
There is no pressure from management to follow fire safety rules	
Fire safety is time consuming	
I don't know what the fire safety rules are	
I see no personal benefit from following fire safety rules	
I don't think my actions will cause a fire	
The supervisors / managers do not follow fire safety rules	
Co-workers do not follow fire safety rules	
Other reasons please specify	

Q120. Do you maintain fire safety practices at home?

Always	Usually	Sometimes	Rarely	Never

Q121. Fire training is necessary.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q122. My training in fire safety is enough for the work I do.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q123. Do you think that you have ever caused fire safety problems by your actions in work?

Yes	No

Q124. What do you think the chances are, of a fire starting in the area that you normally work, in the next five years?

Very low	Low	Medium	High	Very High

Q125. What do you think the chances are, of a fire starting in the rest of your building, in the next five years?

Very low	Low	Medium	High	Very High

Q126. Many of the problems in fire safety are due to the design of the building.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q127. The level of fire safety in your workplace is of a high standard?

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q128. Does management make sure that fire exit doors are kept open (i.e. not locked)?

Always	Usually	Sometimes	Rarely	Never

Q129. Does management keep corridors and exits clear from furniture and equipment?

Always	Usually	Sometimes	Rarely	Never

Q130. Does management respond to the fire alarm signal?

Always	Usually	Sometimes	Rarely	Never

Q131. Does management maintain good fire safety practices at work?

Always	Usually	Sometimes	Rarely	Never

Q132. When management become aware of a **fire safety** problem, it is put right very quickly.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q133. If fire safety rules are broken, management takes it very seriously.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q134. Management is strongly committed to fire safety.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

HOSPITAL FIRE SAFETY

Q135. Do you know the different alarm calls (sound) for the 'normal', 'fault', 'pre-alarm' and 'fire' alarm'?

Yes	No

Q136. In the event of the fire alarm going off in your hospital building what would you normally do? (Please circle yes or no).

Begin evacuation procedures	Yes	No
Wait until told what to do	Yes	No
Investigate the area you normally work in	Yes	No
Investigate the fire alarm panel	Yes	No
Ignore the alarm	Yes	No
Ask other people in your area what to do	Yes	No
Ring security	Yes	No
Ring the safety officer	Yes	No
Ring hospital administration	Yes	No
Other Please Specify		

Q137. If you were to find a fire or see one starting, what would you do? (Please circle either yes or no).

Ring security	Yes	No
Ring the safety officer	Yes	No
Ring hospital administration	Yes	No
Raise the fire alarm	Yes	No
Begin evacuating	Yes	No
Ask other people in your area what to do	Yes	No
Other Please Specify		

Q138. The hospital management is more interested in getting the job done, than in fire safety.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q139. Fire safety is important to the hospital authorities.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q140. Fire safety rules are not good enough in the hospital.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q141. My job carries a high level of fire risk for staff and patients.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q142. I believe the lack of fire safety training could be harmful for staff and patients.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q143. The hospital management would like to spend more money on improving fire safety practices.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Thank you for taking the time to complete this questionnaire

APPENDIX C

SURVEY B

Occupational Safety & Health Risk Management Survey

Dublin Institute of Technology

RISK MANAGEMENT SURVEY

Instructions

This survey is being conducted by the Dublin Institute of Technology. The results are completely confidential. The survey is divided into four main areas

- Work Details.
- Safety & Health.
- Fire Safety.
- Occupational Safety and Health.

PLEASE:

- Answer all questions.
- Give your first natural answer.
- Work quickly through the survey.

WORK DETAILS:

A. Sex: Male ☐ Female ☐

B. Age Group under 20 ☐ 21-30 ☐ 31-40 ☐ 41-50 ☐ 51-60 ☐ over 60 ☐

C. Job Title: Nurse ☐ Ward Attendant ☐ Porter ☐

Student Nurse ☐ Sister ☐ Medical ☐ Medical Student ☐

Agency Nurse ☐ Other please specify ☐

D. Length of service in this area of employment (including training):

Years _____ Months _____

SECTION A : SAFETY AND HEALTH

Q1. In my opinion I can smoke at work if I am careful.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q2. I think that reporting accidents in the workplace is a way of preventing them.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q3. A good standard of safety makes my workplace more competitive.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q4. When the job requires it, the most important thing is to finish on time.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q5. Safety rules are only a way of slowing you down.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q6. I am so used to my work that sometimes I forget the safety rules I should follow.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q7. I think that safety throughout my workplace would greatly improve if unsafe behaviour was punished.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q8. Personal protective equipment is useful in a risky situation.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q9. I find working with a certain amount of risk exciting.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q10. I can do my job perfectly without so many safety rules.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q11. My employer spends enough money on the prevention of accidents in my workplace.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q12. In general, management is strongly committed to safety and health

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q13. When management becomes aware of a **safety** problem in my workplace, it is quickly put right.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q14. Management are more interested in results than safety.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q15. If safety rules are broken, management take it very seriously even when they do not result in an accident.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q16. It is just a matter of time before I am involved in an accident at work.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q17. Money spent on safety training can make an improvement to the running of my workplace.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q18. Management are willing to listen to new ideas in order to improve safety.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q19. Working safely is the most important thing in my workplace.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q20. Management always follow safety rules themselves.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q21. In comparison with other similar workplaces, I think my workplace is one of the safest.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q22. The workforce is regularly reminded about safety rules in my workplace.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q23. Management in my workplace is always informed whether work safety rules are being followed.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q24. Management would like to spend more money on improving safety levels.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q25. My job carries a high level of risk.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q26. Employees who have been given safety training, do their work better.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

SECTION B: GENERAL FIRE SAFETY

Q27. Have you received fire safety training?

Yes	No

Q28. Have you been trained in what do to if the fire alarm goes off?

Yes	No

Q29. Do you know where all the fire exits are located in the area where you normally work?

Yes	No

Q30. Do you know where the break glass units or call points(used to raise the fire alarm) are located in the area where you normally work?

Yes	No

Q31. Do you know where the fire extinguishers are located in the area where you normally work?

Yes	No

Q32. Do you know where your assembly point is located if you have to leave your building?

Yes	No

Q33. If you were instructed to evacuate your workplace or heard the fire alarm, how would you leave your building. Please tick the actions you are most likely to take .

By the entrance you would use when arriving at work	
By your nearest exit to the outside	
The way out as shown by the green running man or exit signs	
You would wait to be told or shown	
You would follow other people	
You don't normally leave the building if the alarm goes off	
Other (Please Specify)	

Q34. Do you begin evacuation procedures (including any pre alarm procedures) when you hear the fire 'alarm' within the first two and a half minutes?

Always	Usually	Sometimes	Rarely	Never

Q35. If you do not begin evacuation procedures within two and a half minutes of hearing the fire alarm; how long do you take?

Between 2.5 and 5 minutes	
Between 5 & 10 minutes	
Between 10 and 15 minutes	
Between 15 and 20 minutes	
Between 20 and 25 minutes	
Between 25 and 30 minutes	
Over 30 minutes	
I don't normally leave the building or area	

Q36. Do you keep corridors and exits clear from furniture and equipment?

Always	Usually	Sometimes	Rarely	Never

Q37. As far as I know, my co- workers follow fire safety rules.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q38. Do you wedge / chain doors in corridors that are used a lot, to stay open?

Always	Usually	Sometimes	Rarely	Never

Q39. If you do not follow all fire safety practices, please indicate, why not. You may tick more than one answer.

I follow **ALL** fire safety practices at all times	
There is no pressure from management to follow fire safety rules	
Fire safety is time consuming	
I don't know what the fire safety rules are	
I see no personal benefit from following fire safety rules	
I don't think my actions will cause a fire	
The supervisors / managers do not follow fire safety rules	
Co-workers do not follow fire safety rules	
Other reasons please specify	

Q40. Do you maintain fire safety practices at home?

Always	Usually	Sometimes	Rarely	Never

Q41. Fire training is necessary.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q42. My training in fire safety is enough for the work I do.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q43. Do you think that you have ever caused fire safety problems by your actions in work?

Yes	No

Q44. What do you think the chances are, of a fire starting in the area that you normally work, in the next five years?

Very low	Low	Medium	High	Very High

Q45. What do you think the chances are, of a fire starting in the rest of your building, in the next five years?

Very low	Low	Medium	High	Very High

Q46. Many of the problems in fire safety are due to the design of the building.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q47. The level of fire safety in your workplace is of a high standard?

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q48. Does management make sure that fire exit doors are kept open (i.e. not locked)?

Always	Usually	Sometimes	Rarely	Never

Q49. Does management keep corridors and exits clear from furniture and equipment?

Always	Usually	Sometimes	Rarely	Never

Q50. Does management respond to the fire alarm signal?

Always	Usually	Sometimes	Rarely	Never

Q51. Does management maintain good fire safety practices at work?

Always	Usually	Sometimes	Rarely	Never

Q52. When management become aware of a **fire safety** problem, it is put right very quickly.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q53. If fire safety rules are broken, management takes it very seriously.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q54. Management is strongly committed to fire safety.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

HOSPITAL FIRE SAFETY

Q55. Do you know the different alarm calls (sound) for the 'normal', 'fault', 'pre-alarm' and 'fire' alarm'?

Yes	No

Q56. In the event of the fire alarm going off in your hospital building what would you normally do? (Please circle yes or no).

Begin evacuation procedures	Yes	No
Wait until told what to do	Yes	No
Investigate the area you normally work in	Yes	No
Investigate the fire alarm panel	Yes	No
Ignore the alarm	Yes	No
Ask other people in your area what to do	Yes	No
Ring security	Yes	No
Ring the safety officer	Yes	No
Ring hospital administration	Yes	No
Other Please Specify		

Q57. If you were to find a fire or see one starting, what would you do? (Please circle either yes or no).

Ring security	Yes	No
Ring the safety officer	Yes	No
Ring hospital administration	Yes	No
Raise the fire alarm	Yes	No
Begin evacuating	Yes	No
Ask other people in your area what to do	Yes	No
Other Please Specify		

Q58. The hospital management is more interested in getting the job done, than in fire safety.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q59. Fire safety is important to the hospital authorities.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q60. Fire safety rules are not good enough in the hospital.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q61. My job carries a high level of fire risk for staff and patients.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q62. I believe the lack of fire safety training could be harmful for staff and patients.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

Q63. The hospital management would like to spend more money on improving fire safety practices.

Absolutely Agree	Agree	No Opinion	Disagree	Absolutely Disagree

SECTION C : OCCUPATIONAL SAFETY AND HEALTH

Q64. Have you ever suffered from a work related illness or injury causing you to **cease work** for **more than three days**?

Yes	No

Q65. When did this last occur? **Month** _____ **Year** _____

Q66. What was the cause or nature of this work related illness or injury?

A	Back Injury	
B	Other muscular injuries	
C	Burn	
D	Laceration / Cut	
E	Slip / Fall	
F	Chemical Exposure	
G	Dermatitis / Skin Irritation	
H	Infectious Disease	
I	Needle-stick / 'Sharps' Injury	
J	Assault by Patient / Visitor	
K	Bullying by Staff	
L	Bullying by Patient / Visitor	
M	**Other (Please Specify)**	

Q67. Did you report the incident / accident on the incident / accident report form?

Yes	No

Q68. Have you ever had an injury or illness at work requiring **first aid treatment**?

Yes	No

Q69. When did this last occur? **Month** _____ **Year** _____

Q70. What was the cause or nature of this work related illness or injury?

A	Back Injury	
B	Other muscular injuries	
C	Burn	
D	Laceration / Cut	
E	Slip / Fall	
F	Chemical Exposure	
G	Dermatitis / Skin Irritation	
H	Infectious Disease	
I	Needle-stick / 'Sharps' Injury	
J	Assault by Patient / Visitor	
K	Bullying by Staff	
L	Bullying by Patient / Visitor	
M	**Other (Please Specify)**	

Q71. Do you report **all** incidents / accidents that affect you in the hospital?

Always	Usually	Sometimes	Rarely	Never

Q72. If you do not report **all** accidents / incidents – please indicate why not (You may tick more than one answer).

A	I report all incidents / accidents	
B	I feel I did not injure myself	
C	Too much paper work	
D	Time consuming	
E	No further action will be taken to improve the situation	
F	Managers / Superiors don't complete the forms	
G	The patient was not considered a high risk patient	
H	I do not report minor incidents	
I	**Other (Please Specify)**	

Q73. If you reported the incident / accident, did any further investigations or change of work practices by the hospital occur?

Yes	No

Q74. How often do you suffer from work-related back pain?

Daily	Weekly	Monthly	Every 6 Months	Once a year	Once every 2 years	Once every 5 years	Never

Q75. How often do you suffer from other musculo-skeletal injuries?

Daily	Weekly	Monthly	Every 6 Months	Once a year	Once every 2 years	Once every 5 years	Never

Q76. Have you received formal manual handling training from your employers in the hospital?

Yes	No

Q77. When did you last receive formal manual handling training from your employers in the hospital?

Month _____ **Year** _____

Q78. How often do you use the correct manual handling procedures when lifting patients?

Always	Usually	Sometimes	Rarely	Never

Q79. How often do you use the correct manual handling procedures when lifting heavy objects (not including patients)?

Always	Usually	Sometimes	Rarely	Never

Q80. How often do you lift patients on your own, i.e. without the assistance of your colleagues?

Always	Usually	Sometimes	Rarely	Never

Q81. How often do you lift patients when you should be using the manual handling mechanical aids provided?

Always	Usually	Sometimes	Rarely	Never

Q82. Are there enough manual handling mechanical aids in your department / ward?

Yes	No

Q83. If your colleagues were lifting incorrectly, would you tell them (i.e. "Mind your back")?

Always	Usually	Sometimes	Rarely	Never

Q84. How often do you carry out flexibility exercises?

At least once a day	At least once a week	Never

Q85. Do the following, put strain or pressure on your back while working? (You may tick more than one answer).

A	Pushing / pulling trolleys	
B	Pushing / pulling patients in wheelchairs	
C	Lifting / transferring patients	
D	Bed making	
E	Static work (i.e. holding a patients limb while a cast is being set)	
F	Opening and closing heavy doors	
G	Being constantly on your feet	
H	**Other (please specify)**	

Q86. How often do you receive burns to the skin while working?

Daily	Weekly	Monthly	Every 6 Months	Once a year	Once every 2 years	Once every 5 years	Never

Q87. How often do you suffer from work-related lacerations / cuts?

Daily	Weekly	Monthly	Every 6 Months	Once a year	Once every 2 years	Once every 5 years	Never

Q88. How often do you slip, trip or fall to the ground while working?

Daily	Weekly	Monthly	Every 6 Months	Once a year	Once every 2 years	Once every 5 years	Never

Q89. How often have you ingested, inhaled or had skin contact with chemicals at work?

Daily	Weekly	Monthly	Every 6 Months	Once a year	Once every 2 years	Once every 5 years	Never

Q90. How often have you ingested, inhaled or had skin contact with drugs (e.g. antibiotics) at work?

Daily	Weekly	Monthly	Every 6 Months	Once a year	Once every 2 years	Once every 5 years	Never

Q91. How often do you encounter work-related needle-stick or 'sharps' injuries?

Daily	Weekly	Monthly	Every 6 Months	Once a year	Once every 2 years	Once every 5 years	Never

Q92. Did you follow the hospital guidelines after the needle stick or 'sharps' injury?

Yes	No

Q93. Have you received training or guidance (not including nursing training) on needle-stick / 'sharps' prevention, i.e. – what to do if one occurs?

Yes	No

Q94. How often are you exposed to/splashed by (direct skin contact) blood/body fluids while working?

Daily	Weekly	Monthly	Every 6 Months	Once a year	Once every 2 years	Once every 5 years	Never

Q95. Do you currently suffer from a skin irritation (e.g. dermatitis, eczema, a rash etc.), caused by substances you handle at work?

Yes	No

Q96. What substance caused this skin irritation/made it worse? (You may tick more than one answer).

A	Glutaraldehyde	
B	Formaldehyde	
C	Cleaning Agents	
D	Sterilising Agents	
E	Latex (Gloves)	
F	**Other (Please specify)**	

Q97. Have you received treatment for this skin irritation?

Yes	No

Q98. Does this skin irritation disappear when you are not in work (i.e. on holidays etc.)?

Always	Usually	Sometimes	Rarely	Never

Q99. Do you moisturise your skin daily to minimise the skin irritation? (Answer only if you suffer from a skin irritation).

Always	Usually	Sometimes	Rarely	Never

Q100. Are you aware of the skincare policy in the hospital?

Yes	No

Q101. Do you currently suffer from a respiratory infection (e.g. asthma) caused by substances you handle at work?

Yes	No

Q102. What substance, in your opinion, causes this respiratory infection? (You may tick more than one answer).

A	Glutaraldehyde	
B	Formaldehyde	
C	Cleaning Agents	
D	Sterilising Agents	
E	Latex (Gloves)	
F	Dust	
G	**Other (Please specify)**	

Q103. Have you received treatment for this respiratory infection?

Yes	No

Q104. How many cigarettes, cigars, pipe etc. do you smoke on a **daily** basis?

I Don't	Less than 10	10 - 20	More than 20

Q105. Have you ever contracted an infectious disease (i.e. HIV, AIDS, Chickenpox, TB etc.) in the workplace in the last .....

Week	Month	6 Months	year	2 years	5 years	Never

Q106. If yes, which disease did you contract?

Answer _____

Q107. How often are you bullied (Name calling, insults, belittling opinion, public professional humiliation, isolation) by superior staff, colleagues or peers at work?

Daily	Weekly	Monthly	Every 6 Months	Once a year	Once every 2 years	Once every 5 years	Never

Q108. Did you report this on the incident / accident report form?

Yes	No

Q109. If you do not report it – please indicate why not (You may tick more than one answer).

A	Fear of no promotional opportunities	
B	Too afraid	
C	Too much paper work	
D	Time consuming	
E	No further action will be taken to improve the situation	
F	**Other (Please Specify)**	

Q110. Have you received formal training by the hospital in the management of violence, personal security, or aggression?

Yes	No

Q111. How often do you suffer from verbal aggression, threats or aggressive physical contact (regardless of injury) from patients or visitors while at work?

Daily	Weekly	Monthly	Every 6 Months	Once a year	Once every 2 years	Once every 5 years	Never

Q112. Have any patients suffered from verbal aggression, threats or aggressive physical contact (regardless of injury) from other patients or visitors while during their stay in the hospital?

Yes	No

Thank you for taking the time to complete this questionnaire.

APPENDIX D

Risk Assessment (Workplace Inspection)
Catering Department

LOCATION	HAZARD	RISK	CONTROL MEASURES	PERSON RESPONSIBLE
GENERAL ISSUES				
All areas	Inadequate hygiene	High	No sign of regular cleaning. Develop and implement cleaning schedule.	Catering Manager
Overcrowding	Workspace allocation too small for number of operatives	Medium	Restrict operatives to essential staff only.	Catering Manager
		Medium	Either increase floor space in catering area or restrict catering activities.	Director of Environmental Services
Floor	Slip from spillage and inadequate fall in levels	High	Re-make floor and leave with adequate slope to allow drainage of surface liquids.	Director of Environmental Services
	Slips and falls due to food debris on floor	High	Spillages should be removed immediately.	Catering Operatives
		High	Develop and implement cleaning schedule.	Catering Manager
	Foul odour and slips and falls	High	Grease traps cleaned daily.	Catering Supervisor
	Inadequate grip to floor	High	Re-make areas of flooring in preparation area. Use of metal duct boarding not acceptable.	Director of Environmental Services
Main entrance doors	Lack of fire containment due to 9 No. fire door leaves wedged open	High	Remove all wedges from fire doors allowing same to open and close freely.	Catering Manager

Schedule of Works = High Risk - Rectification short term Medium Risk - Rectification medium term Low Risk - Rectification long term

LOCATION	HAZARD	RISK	CONTROL MEASURES	PERSON RESPONSIBLE
Administration office - main cooking area	Cross contamination from office to food	Low	Relocate administration office.	Director of Environmental Services
Stores	Lack of food storage space	High	Increase floor storage space or decrease catering activity.	Catering Manager
PLANT & EQUIPMENT				
Rear cooking area	Use of wood to secure oven door	High	Remove wood and leave oven door opening and closing correctly.	Director of Environmental Services
	Contact hazards with machinery	High	Contact hazards due to absence of guard. 3 No. mixers. Affix guard and leave operating correctly.	Director of Environmental Services
	Locked fire exit	High	Leave door so as to open in the direction of travel at all times. If security is an over-riding factor, fit a fire alarm activated lock opening mechanism.	Director of Environmental Services
	Fire and electrocution from exposed wiring	High	Leave all exposed wiring correctly insulated.	Director of Environmental Services
Main cooking area	Condensation from inadequate ventilation	Medium	Carry out a ventilation test.	Director of Environmental Services
Right vegetable preparation area	Slips and falls due to food debris on floor	High	Spillages should be removed immediately.	Catering Operatives
		High	Develop and implement cleaning schedule.	Catering Manager

Schedule of Works = High Risk - Rectification short term Medium Risk - Rectification medium term Low Risk - Rectification long term

LOCATION	HAZARD	RISK	CONTROL MEASURES	PERSON RESPONSIBLE
Potwash	Slip from spillage and inadequate fall in levels	High	Re-make floor and leave with adequate slope to allow drainage of surface liquids.	Director of Environmental Services
Dishwash	Slip from spillage and inadequate fall in levels	High	Re-make floor and leave with adequate slope to allow drainage of surface liquids.	Director of Environmental Services
Corridor (changing area)	Locked fire exit and obstruction of escape routes	High	Increase floor storage space or decrease catering activity. Remove stock from escape route.	Catering Manger
	Combustible material in fire routes	high	Increase floor storage space or decrease catering activity. Remove stock from escape route.	Catering Manger
External right grass area	Continual blockage in drain runs from suspected insufficient diameter of pipes	High	Carry out drain and volume test. Carry out all remedial works as recommended by this test report.	Director of Environmental Services
	Hazard of pest infestation	High	Carry out drain and volume test. Carry out all remedial works as recommended by this test report.	Director of Environmental

Schedule of Works = High Risk - Rectification short term Medium Risk - Rectification medium term Low Risk - Rectification long term